DEVOTED TO
TEXTILE CHEMISTRY
AND
WET-PROCESSING
BLEACHING
DYEING
PRINTING
FINISHING

MAY 16, 1949
VOLUME 38, No. 10

AMERICAN DYESTUFF REPORTER

OFFICIAL PUBLICATION
of the
PROCEEDINGS
AMERICAN ASSOCIATION
OF TEXTILE CHEMISTS
AND COLORISTS

5-22

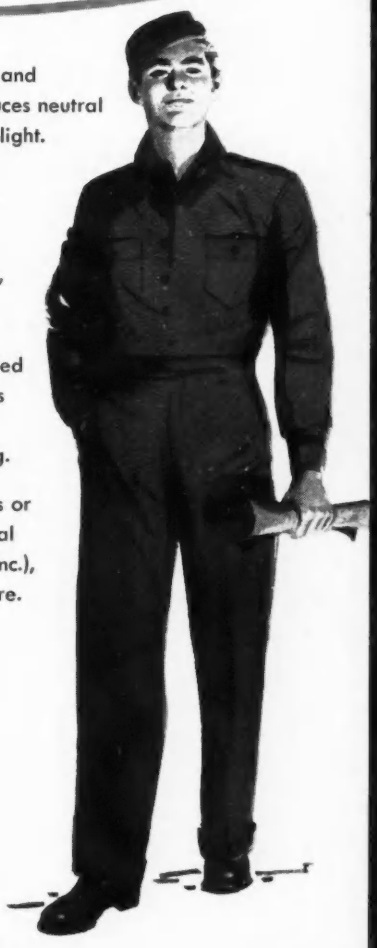
PONSOL
REG. U. S. PAT. OFF.

Olive T Paste

An anthraquinone vat dye for cotton and viscose-process rayon that produces neutral olive shades with excellent fastness to light. Good fastness to crocking, moist pressing, water spotting, laundering with chlorine, washing and dry cleaning.

"Ponsol" Olive T Paste reduces readily, penetrates thoroughly, levels well, has a good exhaust. It is applied by the usual vat dyeing methods. Especially recommended for military fabrics, industrial uniforms and other materials that may encounter severe treatment during wear and washing.

For additional information about this or any other Du Pont dye, write our Technical Staff. E. I. du Pont de Nemours & Co. (Inc.), Dyestuffs Div., Wilmington 98, Delaware.



Du Pont Dyestuffs

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

for

Uniform

dyeing of fine denier ladies' nylon hosiery

NYDYE

* EXCELLENT UNION

. . . unexcelled union dyeing on bright and pigmented nylon.

In addition to giving you excellent union in dyeing, N Y D Y E colors are extremely fast to washing.

ALTHOUSE

Chemical Company, Inc.

READING · PA.

They're both right! For today, most textilemen know that the use of a soap or a synthetic in wet processing operations depends on the nature of the operation, the properties of the fiber, etc. Some operations call for high wetting and penetrating action—others for high detergency or emulsifying power. That's why certain textile processes call for soaps, others for synthetics . . . and Armour makes the best of both. For instance . . .

You need a soap—

In fulling wool—a soap with good lubricant properties like Armour's FLINT CHIPS.

In finishing cottons—a low titered soap, free from rancidity like Armour's CERTIFIED or TEXSCOUR.

In finishing synthetics—a high purity soap, free from rancidity like Armour's FLINT CHIPS, CERTIFIED or TEXSCOUR.

You need a synthetic—

In dyeing cottons and wool—a synthetic that has stability to acid and dye-suspending action like Armour's REGAL or ENERGETIC.

In scouring water repellent or resin treated fabrics—a synthetic with good detergent action like Armour's TRIUMPH or REGAL.

In desizing cottons—a synthetic with rapid penetration and wetting action like REGAL.

You can use either a soap or synthetic—

In kierboiling cottons—and in boil-off—a soap or synthetic with rapid penetration and/or soil removing and suspending action like CERTIFIED or FLINT CHIPS—REGAL or ENERGETIC DETERGENTS.

In scouring raw wool—a soap or synthetic with good detergent properties, easy solubility and rinsability like RE-NU and TEXSCOUR or TRIUMPH and REGAL DETERGENTS.

Armour has a quality soap—a quality synthetic for your every textile use.

ARMOUR *Industrial Soap Division*

Armour and Co., 1355 W. 31st St., Chicago 9, Ill.

WRITE TODAY!

Please send me Armour's handy reference chart to help in selecting the right soap or synthetic for each textile processing operation.

Name ..... *Title* .....

Firm .....

Firm Address .....

City ..... *Zone* .... *State* .....

Do you measure salt by RULE OF THUMB?

For Accurate Salt Measurement *"PASS the SALT"* by LIXATOR*

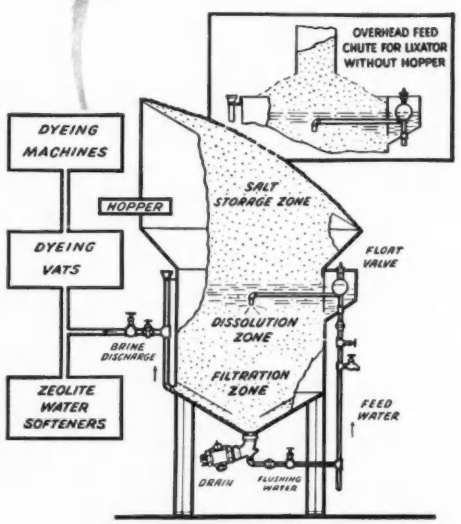
RULE of thumb measurement of salt by volume, in bucket or shovel, or by weight is inaccurate and wasteful.

For example, in measurement by dry salt volume, one cubic foot of dry salt will weigh *anywhere* from 66 to 84.5 pounds. And measurement by dry salt weight is "guesswork," too, for salt may contain from .05% to 5.0% moisture depending upon humidity, length of time in storage, varying bulk and area of the stock pile.

BUT... with the Lixate Process salt measurement is *exact*. Each gallon of Lixate Brine *always* contains *exactly* 2.65 pounds of Sterling Rock Salt. For the Lixator *automatically* makes 100% saturated, crystal-clear, self-filtered brine, that meets the most exacting chemical and bacterial standards. And this brine can be *easily* and *accurately* diluted volumetrically to any desired strength.

Too much salt in the dye bath drives excessive quantities of dye into the fabric causing spotting, streaking and white edges. Too little salt will not properly exhaust the dye. The exact amount of salt is best secured by use of Lixate Brine which always contains exactly 2.65 lbs. of salt per gallon.

Consult our Technical Service Department on your use of salt and brine. The experienced men on this staff will advise you on the proper location for Lixator and salt storage, pumping arrangements, types of pumps, meters, and valves. They will fit the *money-saving* Lixator into your plant operations. Write today!



HOW THE LIXATOR WORKS—*In the dissolution zone*—Flowing through a bed of Sterling Rock Salt which is continuously replenished by gravity feed, water dissolves salt to form 100% saturated brine. *In the filtration zone*—Through use of the self-filtration principle *originated by International*, the saturated brine is thoroughly filtered through a bed of undissolved rock salt. The rock salt itself filters the brine. Nothing else is needed.

NOW AVAILABLE

The New Stainless Steel STERLING* MODEL LIXATOR*

For "Lifetime" Use
For Greater Economy
For Added Cleanliness

*Trade Mark

The **LIXATE** *Process*
REG. U. S. PAT. OFF.
for making brine

INTERNATIONAL SALT COMPANY, INC.
Scranton, Pa.

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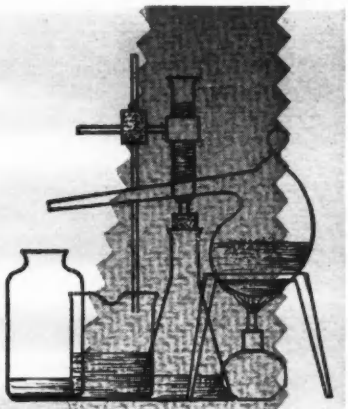


REPCOLENE K-50 ..... applicable to all fabrics

REPCOLENE K-50 has a wide field of application as a penetrating—scouring—wetting—leveling, dispersing agent

STABLE IN HARD WATER—COMPATIBLE WITH SOAP

REPCOLENE K-50 has great softening action on animal and vegetable fibres.

REPCOLENE K-50 is economical as it greatly reduces the amount of finishing compound required after scouring and dyeing operations

WRITE FOR COMPLETE INFORMATION SHEET

REFINED PRODUCTS CORPORATION

Manufacturing Chemists • LYNDHURST • NEW JERSEY

* Manufacturers of PERMA-CIDE, the approved, outstanding, mildew-proofing agent

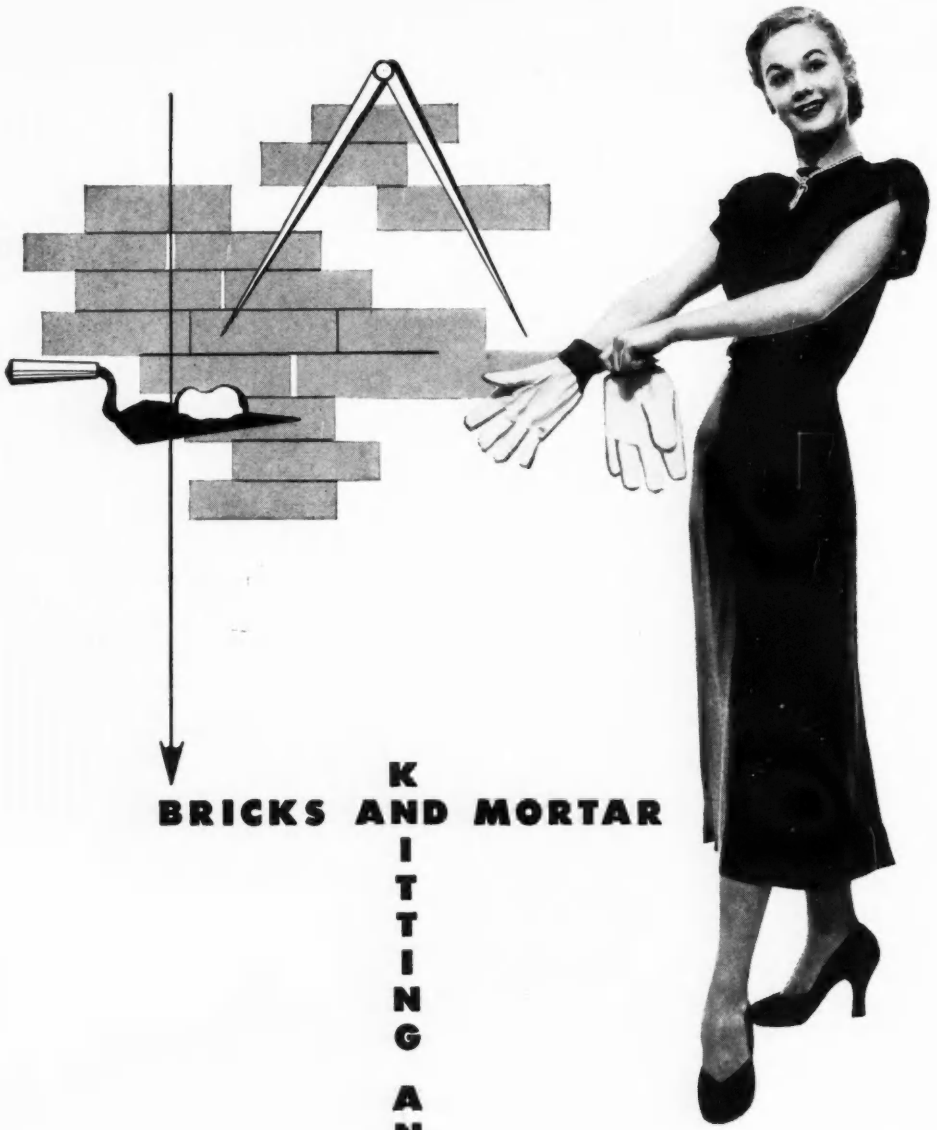
Southern Representative: DYER S. MOSS, 1301 Liberty Life Bldg., Charlotte, North Carolina

New England Representatives: E. L. LEGG, 8 Harding Ave., Providence, R. I.
CLARENCE E. MOSS, 19 Wilson Ave., Rumford (16), R. I.

California Representative: SIDNEY SPRINGER, 2300 S. Vermont Ave., Los Angeles 7, California

Canadian Selling Agents: Berkeley Products Canada, Ltd., 41 Hillcrest Ave., St. Catharines, Ontario, Canada

Exporting Agent: Chem-Col Company, 82 Wall St., New York City



BRICKS AND MORTAR

KNITTING AND FINISH

Building A Wall Or Making A Stocking

. . . the finished product requires two elements. The more easily they combine, the better the end result. Fanco finishes protectively seal in the beauty of fine knitting . . . add lasting loveliness and clear dullness to each stitch. Ask your Fanco fieldman to show you how effectively Fanco finishes can become a part of your product.

W. F. FANCOURT CO.

Philadelphia, Pa.

In the South, Howard A. Virkler, Greensboro, N. C.

SOLVING FINISHING PROBLEMS SINCE 1904

Announcement!

ACETATE BLACK DYERS . . .

amazing new developments have been taking place
in the improvement of our **AMACEL* BLACKS.**

Absolutely tops! the **NEW, IMPROVED**

Amacel BLACKS

. . . BLACK G.S.
. . . BLACK IV EXTRA

As developed with Developer BON or BONASOL* these new, improved *Amacels* give the finest **developed blacks** obtainable. Perfected through the latest scientific advancements, they offer to a greater degree than ever, better fastness—simplified application—consistent shade purity. Both are suitable for box or jig . . . both are highly dispersed—**practically water soluble**—holding stain on adjacent white viscose to a minimum.

American Aniline was the first successful U. S. producer of dyes designed especially for acetate fibres, and high quality has kept *Amacels* at the top in this field.

For detailed information on *Amacel Black G.S.* and *Amacel Black IV Extra,* as well as special data regarding your own particular requirements, consult our nearest branch. A.A.P. technicians are always happy to be of service.

AMERICAN ANILINE PRODUCTS, INC.

50 Union Square, New York, N. Y. • **Plant: Lock Haven, Pa.** • **Branches:** Boston, Mass. **Providence, R. I.** • Philadelphia, Pa. • Charlotte, N. C. • Chicago, Ill. • Los Angeles, Cal. Chattanooga, Tenn. • **Dominion Anilines & Chemicals Ltd.** • Toronto, Canada • Montreal, Canada

*Reg. U. S. Pat. Off.

1949

The Popular Purchasing Agent

(and how he got that way)

ONCE there was a bright new purchasing agent who wanted to become successful. Naturally, he said to himself, "One thing to do is find some costs I can cut." So he sharpened a big red pencil and went to work on the pile of requisitions on his desk.

ONE PRODUCT cropped up again and again. Calgon.* There were requisitions for Calgon for threshold treatment of plant water supply . . . for the dye house . . . for kier boil . . . for bleaching . . . sizing. "Wow," he said, "Calgon must be good stuff."

BUT MAYBE there was some other stuff—just as good—that cost less. Maybe. Being a smart fellow, he knew that cutting costs could sometimes be awful expensive. So he decided to have a talk with the plant chemist first.

"I WAS just thinking," he told the man behind the beakers, "about all these requisitions for Calgon. Maybe we could buy some other phosphate that's just as good —only cheaper. Think of the money we'd save."

"JUST A MINUTE," the chemist said. "First, we don't buy Calgon, exactly—we buy the results we get with Calgon. They never vary. I said, 'never.' Second, there isn't any just-as-good phosphate."

"FOR INSTANCE," the chemist continued, "When we use Calgon in the dye house, we get cleaner goods, brighter shades, and less 'crocking.' There's never any danger we'll have to bleach and redye our fabrics. I wish I had the money Calgon saves us there alone. I'd buy a house. I'd buy a row of houses."

"BUT", the purchasing agent said.

"BESIDES," the chemist continued, "look at the trouble Calgon saves us. I mean big trouble. We get in a jam on a new process or something and I see dollars sailing out the window. And maybe me out the door. That's when I'm glad I can call on Calgon's chemists. See what I mean?"

THE PURCHASING AGENT was 'way ahead of him. He saw how he could get to be a real popular guy in a hurry. He scooted back to his desk and grabbed his big red pencil and marked a big "RUSH" on all those Calgon requisitions.

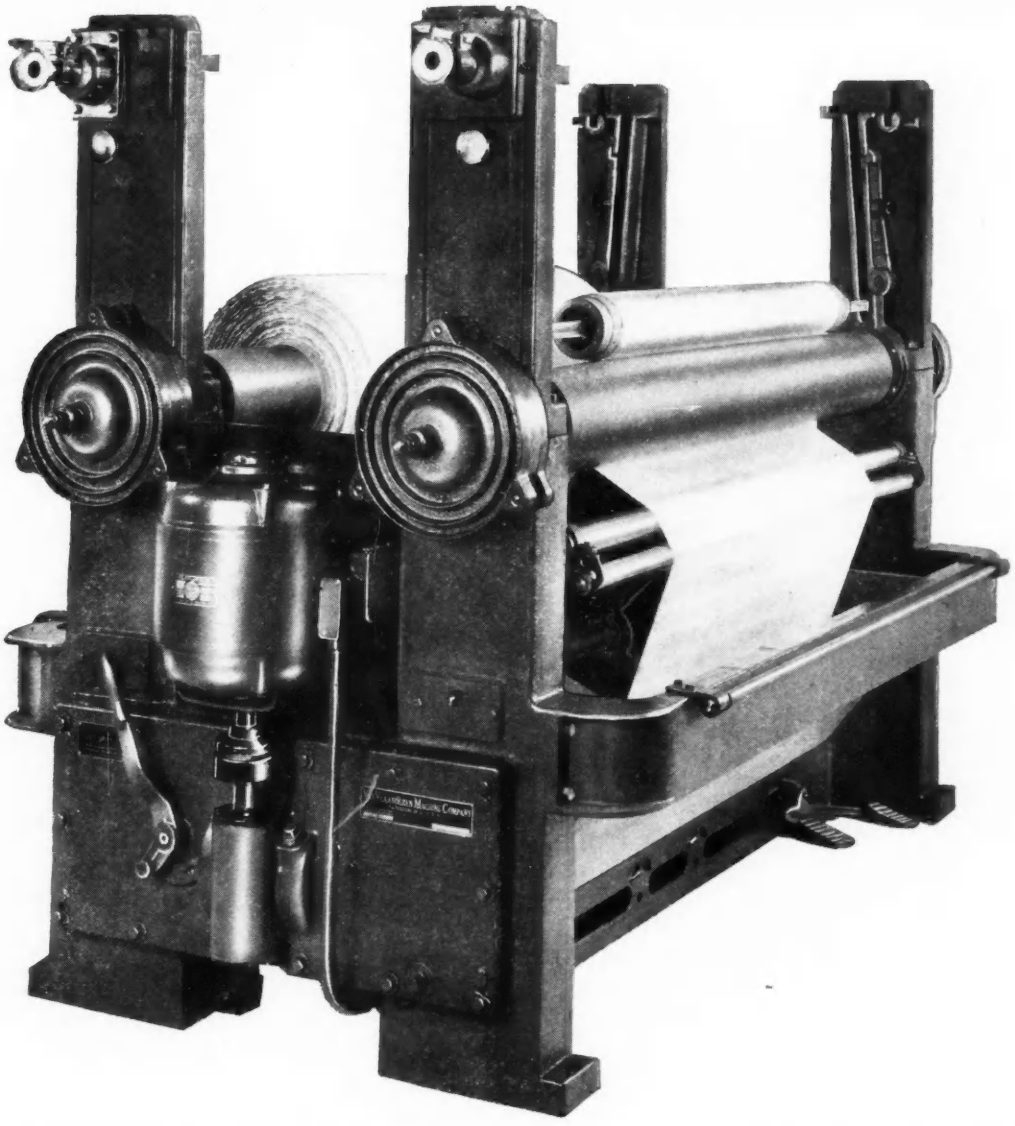
*T. M. Reg. U. S. Pat. Off.

HAGAN HALL BUROMIN CALGON

calgon, inc.

A SUBSIDIARY OF HAGAN CORPORATION

HAGAN BUILDING PITTSBURGH 30, PA.



PREFERRED for NYLON

When dyeing Nylon a uniform, minimum tension is so important that this Van Vlaanderen machine is being used more and more. Here's why . . . both let-off and take-up rolls are driven simultaneously* giving a nearly constant cloth speed with a uniform, minimum tension.

Enclosures for this machine and automatic stopping and reversing equipment are available. We will be glad to have your inquiry.

*** On conventional jigs the rolls are driven alternately and the tension increases with the speed as the take-up roll increases in size.**

VAN VLAANDEREN MACHINE COMPANY

370 Straight Street • Paterson 3, New Jersey

World's largest manufacturer of machines for processing modern fabrics

FOR YOUR INFORMATION

How wool mills chop costs

Mill management is being called on to deliver profits even when sales volume is down. One plain way to do it is to pare operating costs, to produce less expensively and in less time. Many mill managers, and more every day, are realizing they can do this with a Monsanto chemical, Syton, because Syton gives from 10%-to-30% more yarn strength in woolen and worsted spinning.

Here is how Syton increases earnings:

1. By helping to produce more in less time.

Many mills . . . spinning carpet or knitting yarns for example . . . reduce twist with Syton and hence boost production. Other mills report fewer ends down during spinning and weaving . . . better roping condensation, reduced fly and card waste. Production costs go down, savings up.

2. By improving the product

Many mills find they can spin blends hitherto impossible. Almost all mills report that Syton enables them to spin any given stock to a finer count.

Hundreds of woolen and worsted spinners . . . more every day . . . are proving that Syton is a practical production speeder . . . and a money maker for management.

Certainly that's reason enough to find out how Syton can work in your own mill. We're ready to give you full details about Syton and our technicians are ready to help you right at your own plant.

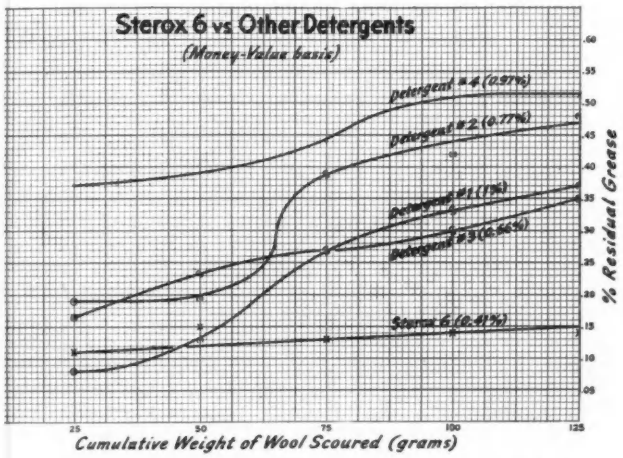
New, free booklets describe your savings with Syton

Four newly completed booklets describe in detail the uses of Syton for more efficient, and *economical* woolen and worsted spinning. Check one or all you wish, and get them through the handy coupon.

For woolen spinners: *"Syton for stronger, more uniform yarns."*
For worsted spinners: *"Syton for worsted spinning: More uniform yarns, increased strength, yarns spun closer to count.*
For carpet makers: *"Syton for loftier, 'more blooming' yarns."*
For Commission spinners: *"Syton for faster spinning of all types of fibers."*

STEROX 6

a new detergent for wool scouring



Sterox 6, a new detergent which Monsanto Chemical Company is introducing to the textile industry, has demonstrated high efficiency in the removal of oil and grease from wool fibers.

This contribution, the result of extensive research on synthetic detergents, wetting agents and cleaning compounds, is recommended for effective wool scouring.

Sterox 6 is a detergent that varies greatly in chemical composition and action from any other detergent.

Test work shows that Sterox 6 is outstanding, not only for removal of oil and grease, but also for its ability to hold them in suspension without redeposition on the fiber.

Further tests show that Sterox 6 is more efficient than other detergents on a money-value comparison.

For full information on Sterox 6, mark the handy coupon.

MONSANTO
CHEMICALS — PLASTICS

SERVING INDUSTRY . . .
WHICH SERVES MANKIND

STYMER "S" acetate size

eliminates GEL problem

Enthusiastic mill owners everywhere report that Stymer "S" can be left in size-boxes overnight . . . that it does not "set" when cold, causing lines to clog. It eliminates messy clean-up jobs . . . saves both time and materials.

Stymer "S" is a new synthetic sizing agent whose uniformity and quality are strictly controlled. In addition to its non-gel properties, Stymer "S":

Increases plant efficiency.

Gives warp a superior finish over a wide range of humidities and temperatures.

Reduces static electricity.

Is non-gumming, non-thickening, non-mildewing; will not set or sour.

Minimizes dirty knot problems. Stymer's detergent power removes dirt picked up by knots.

Forms abrasive-resistant film without undue stiffening.

Is easy to dissolve from the woven fabric in warm water containing a mild detergent.

New Stymer Booklet

A new, free booklet on Stymer is available to you through the handy coupon. Send today for the booklet: "Stymer 'S', the Synthetic Size for improved Slashing of Synthetic Warps."

MONSANTO CHEMICAL COMPANY, Textile Chemicals Department
Desk ADT 19, 140 Federal Street, Boston 10, Mass.

Please send me: New Syton booklet for spinners, for worsted spinners, carpet makers, commission spinners; New Stymer booklet; full information on Sterox 6.

Name Title

Company

Address

City Zone State

Syton, Stymer, Sterox: Reg. U. S. Pat. Off.

What makes it Sell ?

What puts the eye-appeal and sales-appeal in synthetic fabrics? Is it just the design? You know that's only half the story. Quite as important is the fabric finish—the softness, the pleasing hand, the draping qualities.

Back of every good finish there's good processing — the efficient type of processing you can count on with Olate.

Olate has a well established reputation for quick solubility, exceptional detergency, and good lubricating properties. Olate rinses from fabrics rapidly and thoroughly. Throughout the industry this pure, neutral, low titer soap is widely used because of its efficiency, economy, and gentleness.

Olate can help *your* plant turn out synthetic fabrics which have the eye-appeal so closely related to sales-appeal. Try it.

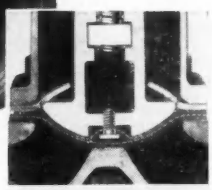
Procter & Gamble

Olate

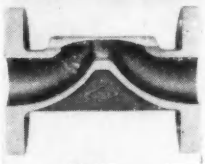
safe and efficient for every textile soap usage!

Simple as pinching a rubber tube

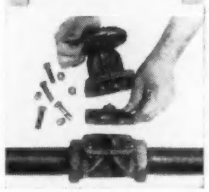
A GRINNELL-SAUNDERS DIAPHRAGM VALVE works on a simple principle . . . it pinches tight for positive closure and opens wide for streamlined flow. The working parts of the valve are completely isolated from the fluid . . . no corrosion, no contamination and no leaks. Choice of diaphragm material. Body materials . . . cast iron, malleable iron, bronze, aluminum, stainless steel. Body linings . . . glass, lead, rubber or synthetics.



NO METAL-TO-METAL SEAT . . . The large contact area on which this flexible diaphragm seats gives positive closure even when grit, scale or other solid matter is temporarily trapped.



MINIMUM RESISTANCE TO FLOW . . . Smooth streamlined fluid passage without pockets prevents accumulation of sludge and reduces friction resistance to a minimum.



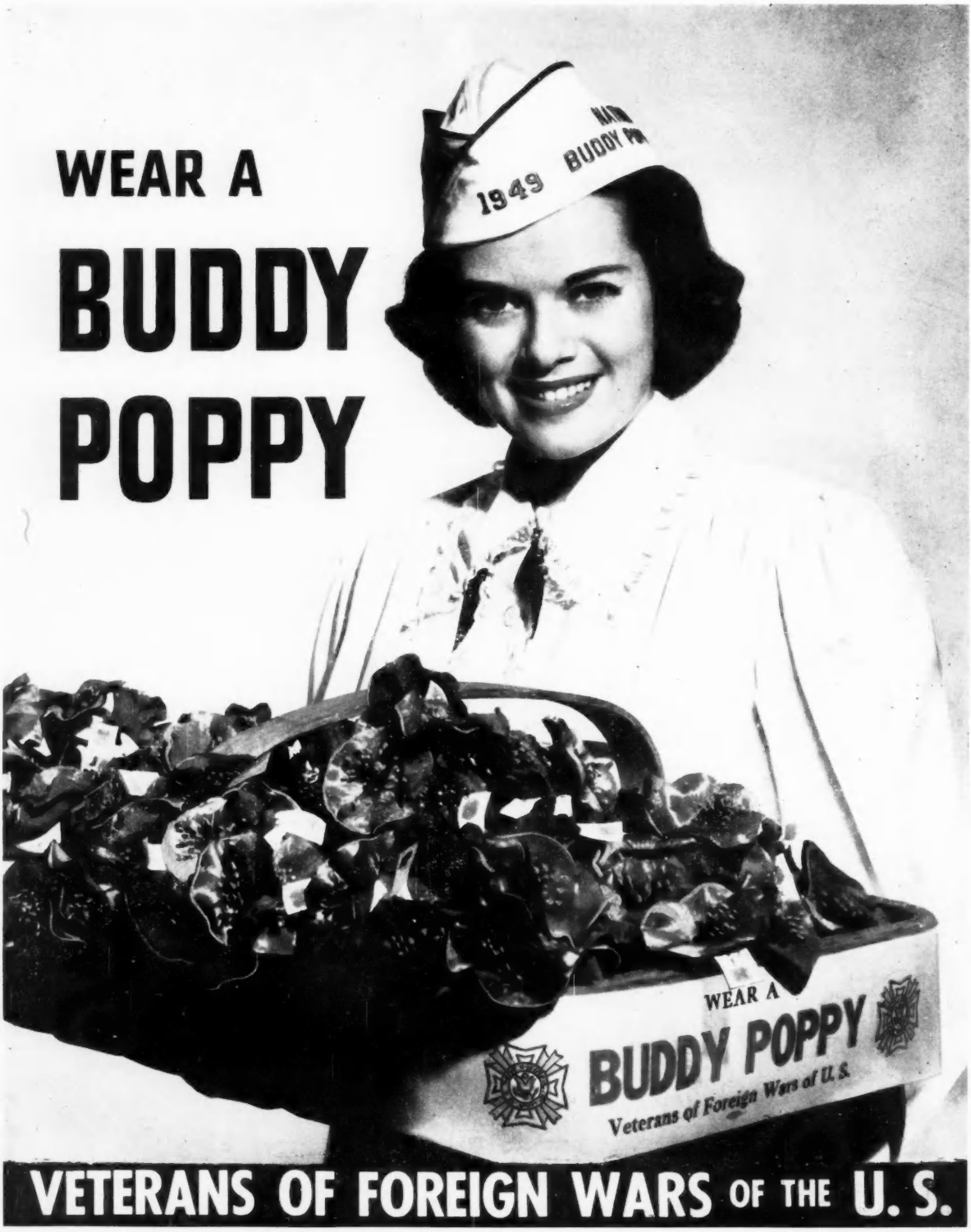
MAINTENANCE REDUCED . . . The diaphragm is the only part that normally wears out. Replaced in a few minutes without removing valve from line.

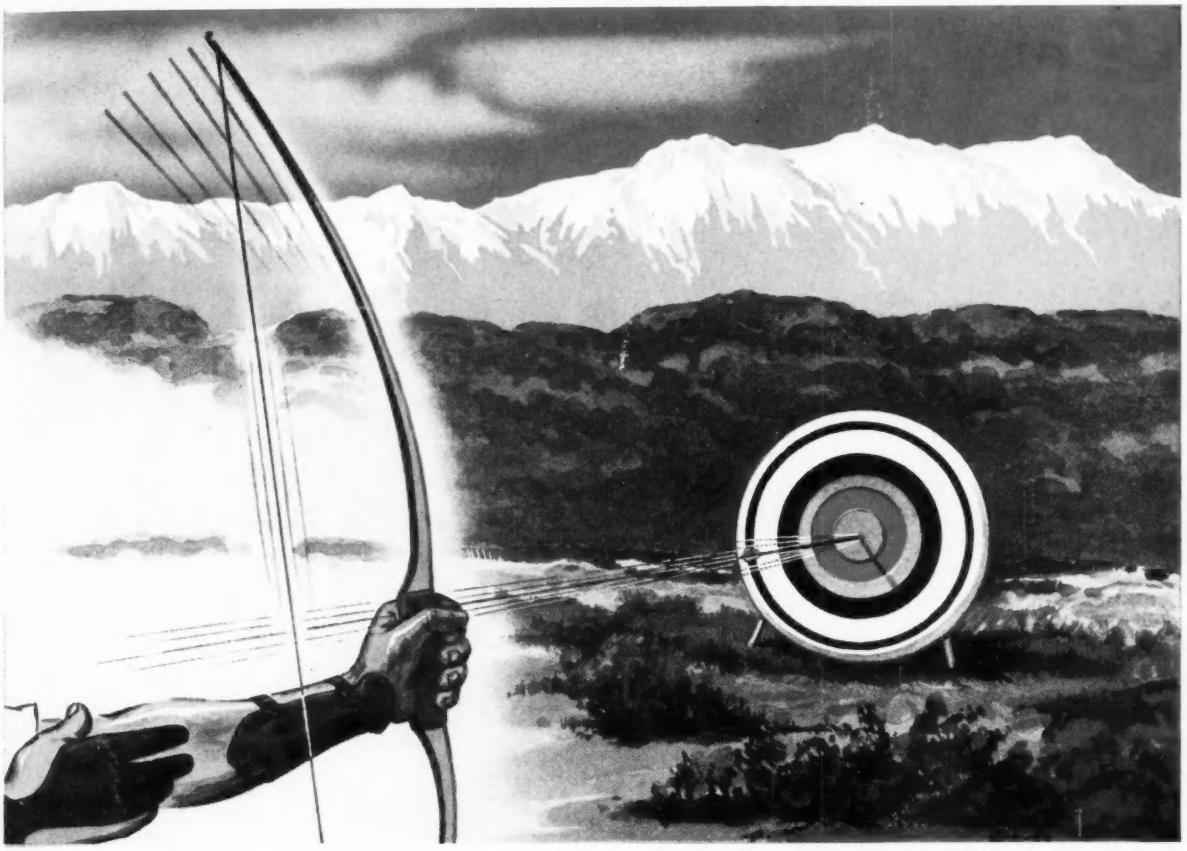
Available in various combinations of valve bodies and operating mechanisms.

99 YEARS — PIPING

GRINNELL

Grinnell Company, Inc., Providence 1, Rhode Island. Branches: Atlanta • Buffalo • Charlotte • Chicago • Cleveland • Cranston • Fresno • Kansas City • Houston Long Beach • Los Angeles • Milwaukee • Minneapolis • New York • Oakland • Philadelphia • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane


WEAR A
BUDDY
POPPY
1949
WEAR A
BUDDY POPPY
Veterans of Foreign Wars of U. S.
VETERANS OF FOREIGN WARS OF THE U. S.



FLEXIBILITY SCORES

It's the flexibility and resilience of the bow that sends the arrow straight to the mark, and gives you a bull's eye.

And it's flexibility in a de-sizing agent that makes a difficult finishing job easy. That's the reason bleachers and dyers chalk up a high score for Diastafor brand de-sizing agent—Type L.

The variables that are present with almost every lot of goods coming to your mill bring problems to the men in charge of finishing operations that demand the utmost in skill and equipment.

In dealing with these variables they know the special value of an all-purpose de-sizing agent like Diastafor—Type L, which works well under so many different conditions.

Diastafor—Type L helps you score a bull's eye, even on your hardest lots, because of its workability in a wide range of temperatures. It will give good results in a wide pH range as well.

Diastafor is easy to use, it's economical, it's dependable. It will give you a fine "hand" whether you are working with cottons, rayons or mixed goods. It is kind to your fabrics, too. Tensile strength is never impaired. Diastafor gives you the finish you need for even dyeing, with no streaks or blemishes. It works well in the continuous process.

Our sales and technical staffs are always glad to give special assistance on de-sizing problems when their services can be helpful. Write Standard Brands Incorporated, *Diastafor Department*, 595 Madison Avenue, New York 22, New York.

DIASTAFOR

A TRADE MARK OF STANDARD BRANDS INCORPORATED

AN OPEN LETTER TO ALL CONCERNED

WITH THE TEXTILE WET PROCESSING INDUSTRY:-

Let me bring you up-to-date as of press time — with the Textile Wet Processing Exposition that will be held in New York, at the 71st Regiment Armory, 34th Street and Park Avenue, June 6, 7, 8, 9 and 10.

This show is set up expressly for the fast-moving wet processing branch of the textile industry.

It is the only show of its kind ever held anywhere with *every* exhibit geared to the interests of those engaged in the bleaching, dyeing, printing, mercerizing and finishing of *all* textiles — no spinning, weaving, or knitting machinery, or any equipment for the MAKING of textiles will be shown.

Mills with their own finishing departments, and independent finishing companies, are sending their top-level men to this show. They're all coming to see the exhibits of key manufacturers of machinery and supplies, companies like Butterworth, Van Vlaanderen, James Hunter, Perkins, Blickman, Glasco, General Dyestuff, Richmond Oil, Soap & Chemical, Standard Brands, Walton Laboratories, Perfecting Service, Crucible Steel, Eastern Stainless, Cadgene, Bemis Bros., Hart Moisture Meters, Trumeter Company, Ten-Co Machine Co., Kearny Mfg. Co., Mount Hope Machinery Co., etc. Every exhibit will be of keen interest to all attendees.

For men in the wet processing phase of the industry it will indeed be a great show.

If you are a manufacturer of processing machinery, chemicals, dyestuffs, desizing agents and/or other supplies used in the wet processing phase of the textile industry, *this show offers you the opportunity to display your product to men who are eager to find out how you can help them.*

Mills with their own dyeing and finishing plants and commission dyers today are seeking methods of increasing efficiency of operation to improve their competitive position, *and they have the cash reserves NOW* to enable them to buy the things they feel will improve *production results.*

Textile Wet Processing Equipment & Supplies Exposition

Executive Offices: Suite 205—36 West 47th Street, New York 19, N. Y.

ARTHUR TARSHIS, *Exposition Manager*

LU 2-4627-8-9

IGEPALS

outstanding non-ionic surface active agents for wool, cotton and synthetic fibers.

- Excellent wetting, emulsifying and scouring properties
- Quick rinsing
- Readily soluble at all temperatures
- Equally effective in hard or soft water
- Neutral reaction
- Resistant to acids and alkalis
- Non-electrolyte—non-reactive
- Compatible with anionic and cationic compounds

Our skilled technicians are available for plant demonstrations.

GENERAL DYESTUFF CORPORATION

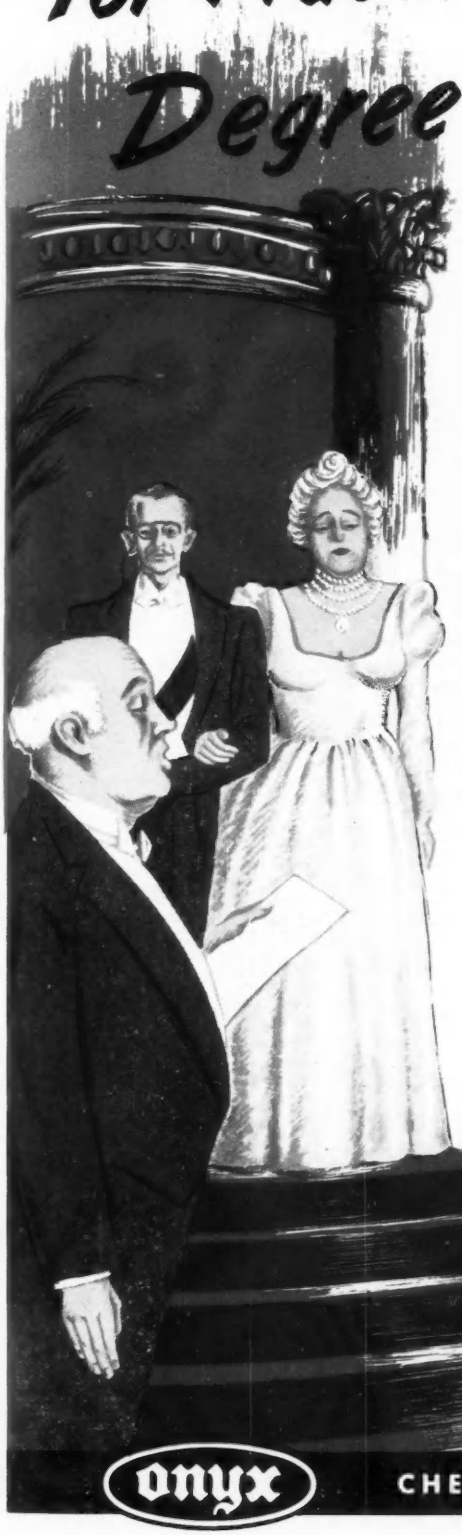
435 HUDSON STREET, NEW YORK 14, NEW YORK

BOSTON · CHARLOTTE · CHICAGO · PHILADELPHIA · PROVIDENCE · SAN FRANCISCO

May

for Practically any Degree of Stiffness...

the XYNO RESINS



FOR special stiffening effects on any textile, from organdies to ribbons, nettings to back-filled piece goods, one of the Xyno Resins or a combination of two or more will give you the finish you want.

These stable, aqueous dispersions of synthetic thermoplastic resins require no heat setting or curing. They contain no solvents and impose no hazards of flammability or toxicity. Compatible with hard water, alkalies and dilute acids, they offer a wide range of interesting new possibilities in stiffening and sizing effects.

XYNO RESIN 362 is a viscous dispersion of relatively large particle size, used for exceptional stiffness. It makes an excellent back-filling agent, and has been particularly useful on organdies, ninons and marquisettes.

XYNO RESIN S69 is a water-thin dispersion of fine particle size. It gives "springy" hands on nylon and other nettings, besides improving wear resistance and reducing slippage on many other textiles. It has the best wash resistance of the Xyno Resins.

XYNO RESIN AA40 is a water-thin dispersion of moderate particle size, of especial interest to ribbon manufacturers. Many interesting effects in crispness of cotton, rayon, nylon and acetate piece goods may be obtained by combining Xyno Resin AA40 with Onyx NCF Paste or Liquid Resin SS.

Onyx Technical Bulletin TX-2 covers not only the Xyno Resin Dispersions but the two Onyx Resins, NCF Paste and Liquid Resin SS. Write for a copy.

ONYX OIL & CHEMICAL COMPANY

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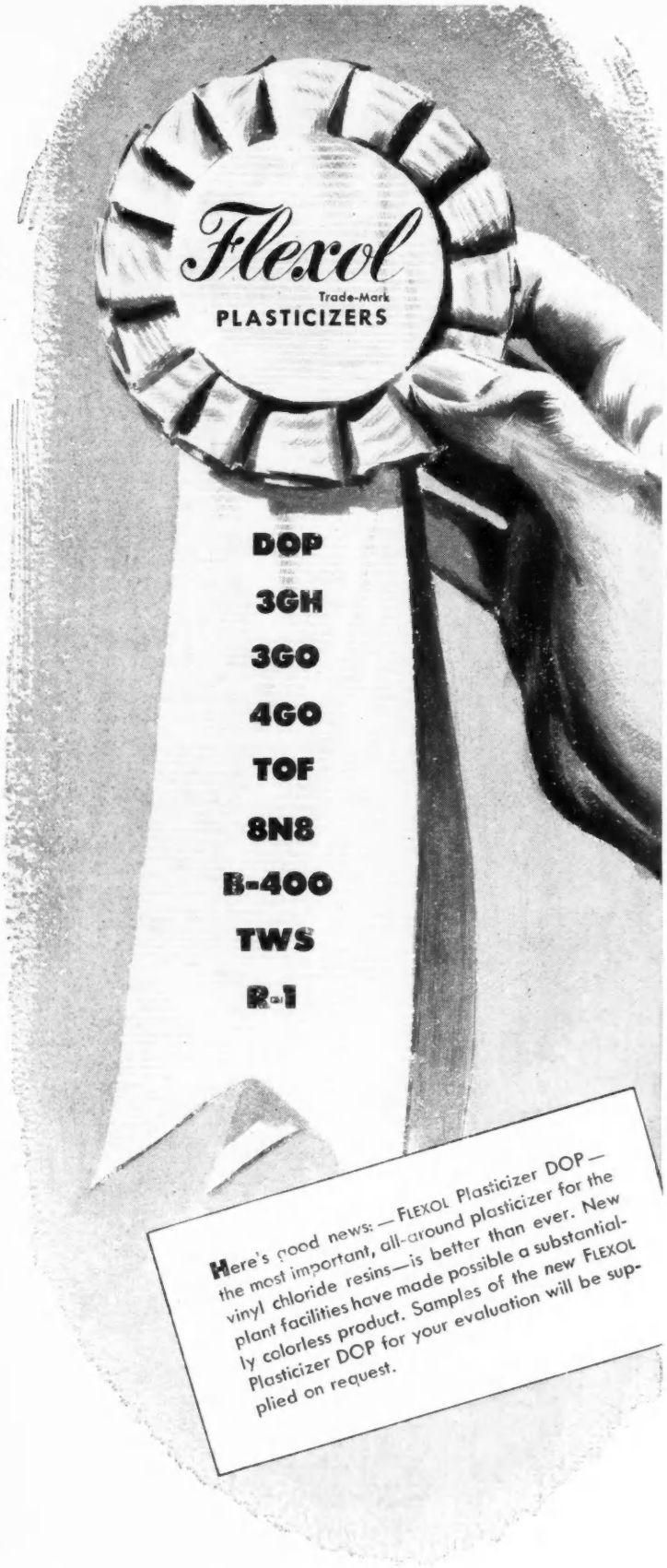
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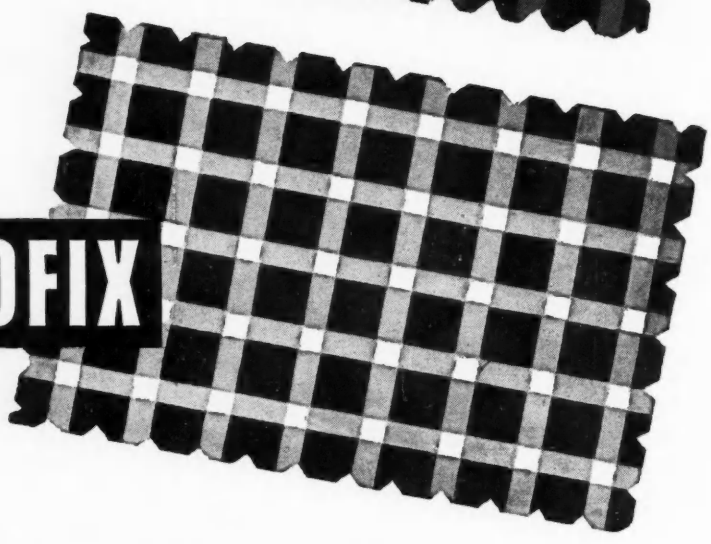

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Incorporating Textile Colorist and Converter

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Official Publication of the Proceedings of the American Association of Textile Chemists and Colorists

Published every other Monday by the **HOWES PUBLISHING COMPANY, INC.**, One Madison Avenue, New York 10, N. Y. **C. R. Howes, President**; **Harry F. Crawford**, Executive Vice-President; **Norman A. Johnson**, Vice-President; **Ernest J. Finan**, Treasurer; **Myron D. Reeser**, Secretary; **C. Essenbreis**, Assistant Secretary.

Also Publishers of
HOSIERY INDUSTRY WEEKLY
HOSIERY MERCHANDISING

MAY 16, 1949

VOLUME 38 NUMBER 10

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AMERICAN
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VOLUME 38 MAY 16, 1949 NUMBER 10

A WATER ABSORBENCY APPARATUS

E. C. JACKSON and E. R. ROPER

I. Introduction

A NEED has long been felt in the textile industry for a practical laboratory means of measuring absorptive properties of fabrics such as toweling which would bear some resemblance to the end use of the fabric. In the use of a towel for drying, the wetting is from one side and some pressure is applied. A portion of the towel is used not until it becomes saturated but until it contains less than 100% by weight of water when the user transfers to another portion of the towel. This makes the initial rate of wetting the important factor in towel evaluation.

Some tests in current use involve dipping a towel in water for a definite time and then determining the amount of water retained by the towel. This involves the water retaining property of the towel when saturated and is not necessarily related in any way to the use of a towel in drying an object.

The capillary rise or wick-up method can be used to obtain a plot of capillary rise versus time. However, on toweling the capillary rise is usually along the binder threads only and the terry loops play little part in results obtained.

LaRose *(1)* described a method for measuring drying capacity with which pieces of toweling were weighed before and after contacting a damp porous plate for varying lengths of time. The moisture picked up was plotted against time. This method is time consuming due to necessity of weighing many samples, and involves the use of a large number of samples to obtain a plot showing different time intervals.

Kettering *(2)* proposed a modification intended for evaluating print cloths which used a capillary tube connected to the water source under a porous plate. The absorption rate of cloth placed on top of the plate could be visually determined by timing the rate of flow of water in the capillary tubing. The necessity of weighing was thus eliminated.

The apparatus described here is based on Kettering's original idea but with some modifications which be believe make it more flexible and capable of being used to evaluate a wider range of fabrics of different absorptive powers.

Results obtained can be used to rate a series of fabrics either for the initial absorption rate or for the maximum absorptive power. A mathematical formula has not been found which will fit all experimental results and therefore no absolute figure can yet be used which would be reproducible from one laboratory to another. However, the order of rating of a series of fabrics should be reproducible between laboratories.

II. Description of Apparatus and Test Method

A. REQUIREMENTS.—

1. Test Specimens

a. A specimen at least 12 x 12 inches of uniform surface of fabric to be tested is required for this test. In the case of terry fabric samples this should be composed of all terry with no flat weave or selvage in the body of the specimen.

b. The specimen is conditioned in a standard atmosphere of 65% relative humidity and 70° F. for at least four hours before testing.

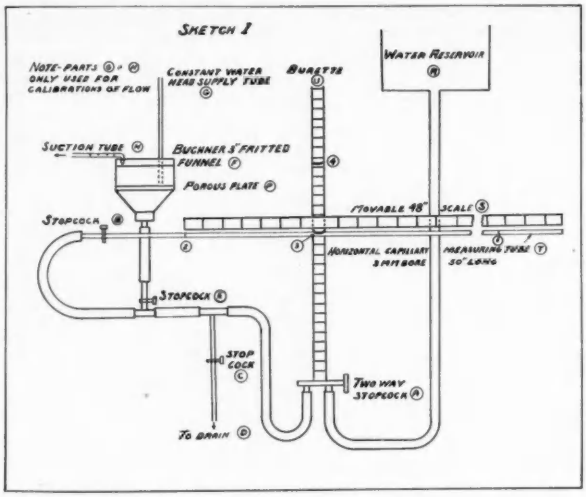
c. After the specimen has properly conditioned, ten uniform samples are cut from the specimen by means of a die so as to be the size and shape of the porous plate of the apparatus. The ten samples are then weighed together and 1/10 of the total weight is taken as the average weight of the sample.

Note—A 3" diameter round porous plate is recommended.

2. Apparatus

a. Absorbency Tester (see Sketch I). This apparatus is composed of a Water Reservoir *(R)*, connected by a rubber tubing to one outlet of the Two Way Stopcock *(A)* at the base of the Burette *(U)*. The other outlet of Two Way Stopcock *(A)* is connected by a rubber tube to a T-shaped glass tubing having a Stopcock *(C)* in the vertical portion of the T-shaped glass tubing, leading to a Drain *(D)*. The other end of the horizontal portion of the T-shaped glass tubing is connected by a rubber tubing to one end of the horizontal portion of a second T-shaped glass tubing. The other end of the horizontal portion of this second T-shaped glass tubing is connected to an open end horizontal Capillary Measuring Tube *(T)* of 3 mm. bore, 50" long. The vertical portion of the T-shaped glass tubing extends upward through a rubber stopper into the base of a 3" Buchner Fritted Funnel *(F)* furnished with a Porous Plate *(P)* of fine porosity, as indicated in Sketch I. The capillary measuring tube shall be installed and held horizontal and level below the level of the Porous Plate *(P)*. A movable Scale *(S)* 48" long is attached above the Horizontal Capillary Measuring Tube *(T)* in such manner that the O end of the scale can be placed on the meniscus near the open end of the Horizontal Capillary Measuring Tube *(T)* when the machine is in proper equilibrium and ready for use, as described in Section B.

Stopcocks *(B)* and *(E)*, Water Supply Tube *(G)*, and Suction Tube *(H)* are not necessary for measuring absorbency but are convenient for establishing effective zero point and calibrating flow proper-



ties of plate as described under Appendix II.

Not shown in Sketch I is an open tnd metal cylinder which will just fit inside the Buchner Funnel, for the purpose of placing the samples on the plate quickly and uniformly. Around the lower edges of this cylinder are several strips of two-sided gummed tape, which hold the samples to be tested to the lower end of the cylinder. A water repellent cloth bag containing lead shot weighing 1100 grams is dropped inside the metal cylinder when making tests, to insure uniform pressure on the samples.

3. *Standard Conditions.*

a. The entire apparatus ,including the water reservoir, is operated in a standard atmosphere, as described in paragraph b. Distilled water having a temperature of 70°F. ± 2° is used in the testing apparatus.

B. PROCEDURE.—

1. In preparing the apparatus for making a test, the Buchner funnel and connecting tubes must first be filled with water. Since it is difficult to drive all trapped air through the porous plate by forcing water beneath the porous plate, it is best to disconnect the Buchner funnel temporarily and fill with water by inverting the funnel. Then by holding the small end of the funnel closed, connect the water-filled funnel back into the water-filled connecting tubes so as to eliminate trapped air. When first using a previously dry funnel it is also necessary to force water through the funnel for some time by means of a positive pressure head to force out air trapped in the pores of the funnel.

2. After the funnel and connecting tubes are filled with water as described above, water is run into the Burette *(U)* from the Water Reservoir *(R)* through the Two Way Stopcock *(A)* to a point above the level of the Measuring Tube *(T)*. Then from the Burette *(U)* water is run into the apparatus from the other outlet in the Two Way Stopcock *(A)*, until the Measuring Tube *(T)* is filled with water. (The other tubes of the apparatus were filled with water as in paragraph *(1)* above.) By manipulating Stopcock *(C)* water is drained out of the system until the water level in the Burette *(U)* is the same as that in the Measuring Tube *(T)*. Under this condition the meniscus in the measuring tube is at rest and the system is in balance.

3. The apparatus is now in equilibrium and Stopcocks *(A)* and *(C)* are completely closed. Stopcock *(B)* and *(E)* remain open permanently for absorbency measurements. The distance of the Porous Plate *P) above* the Measuring Tube *(T)* determines the degree of wetness of the plate and also the rate of absorbency. For any set of comparisons between a number of samples this distance must be fixed and constant.

With a fine porosity plate the plate can be at least twenty inches above the level of the Measuring Tube *(T)* without sucking air through the plate. However, such a differential gives a very dry plate and this can be used only to measure absorption rates on very absorbent goods. For measurements covering a range of absorbencies, a differential of 2.5-10 inches is suggested.

4. One of the test samples prepared and weighed as described in paragraphs A (1a, 1b, 1c) is attached by gummed tape to the metal cylinder. This cylinder and sample are placed in the Buchner funnel on top of the Porous Plate *(P)* and the shot bag containing the lead shot as described in paragraph A (2a) is impediately dropped on the sample.

The fabric sample begins to absorb water almost as soon as it is placed on the plate and the meniscus in the measuring tube starts to move.

5. Since the apparatus is at equilibrium when the test sample is placed on the Porous Plate *(P)* and stopcock *(A)* and *(C)* are closed, the water absorbed by the test sample can be supplied only from the Capillary Measuring Tube *(T)*. By calibrating the tube for grams of water per unit length, the weight of water absorbed can be calculated from the distance the meniscus moves in the Measuring Tube. By means of a suitable timing device the lapsed time for passage of the meniscus over different portions of the scale can be determined. (See Appendix I). However, for routine work the initial absorption rate is determined by noting the time lapsed for passage over a portion of the scale corresponding to approximately 20 to 50% absorption on the weight of the sample. This can be done with a stopwatch. If a maximum absorption figure is desired, the sample is left to contact with the plate until the meniscus ceases to move and the distance is recorded.

6. After making necessary observations on one sample, this sample is removed from the plate and discarded. The apparatus is again set in equilibrium and another sample tested as described previously. Duplicate tests should be made on 5-10 samples from the same specimen.

III. Shapes of Absorption Curves

Figures 1, 2, and 3 show the general types of absorption curves produced with the apparatus. From Figure 1 it is seen that there is an initial practically straight line portion, indicating a practically constant absorption rate, extending from about 20-70% water absorbed. This is followed by a curving portion indicating a gradually decreasing absorption rate until the maximum is reached. Figure 2 shows an enlargement of the initial portion of the curve made by timing the progressive absorption with an electric timer. Again the straight line section in the same limits is evident. Kettering *(1)* noted the same constant initial absorption rate on print cloths. His curves, however, all showed a straight line from the zero point. The curves shown here will not originate as a straight line from zero due to a perceptible lag before the sample begins to absorb water. This initial lag seems to be rather variable from one specimen to another of the same sample. Therefore in making routine determinations of the initial constant and maximum rate which is the straight line portion of the absorbency curve it is recommended that timing be made of the passage of the meniscus over the portions of the measuring tube corresponding to 20-25% moisture absorption based on the weight of the towel sample.

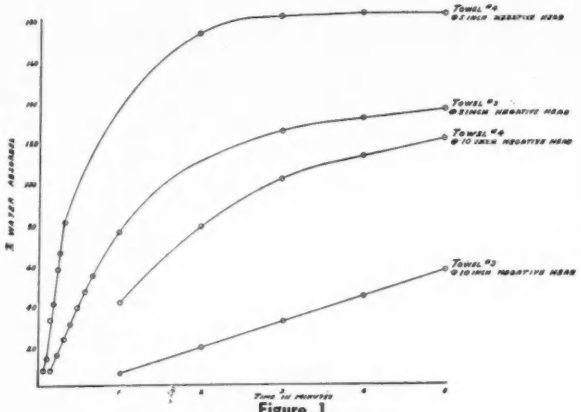


Figure 1
Typical Absorption Curves
#4 Fine Porosity Plate

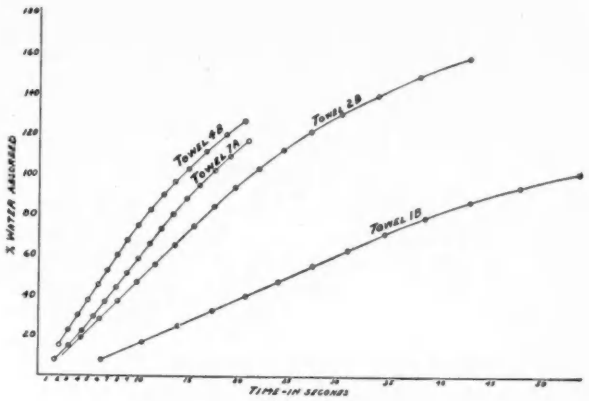


Figure 2
Initial Portion of Absorption Curves
#4 Fine Porosity Plate—5 Inch Negative Head

Figure 3 shows the amount of water absorbed over extended time intervals on towels of markedly different characteristics. This graph includes measurements at several different negative pressure heads. It will be seen that some of the samples are still absorbing after five minutes and that in order to obtain a maximum value on these the timing would have to be extended excessively. The maximum amount absorbed does not necessarily bear any relation to the initial rate of absorption. For the samples shown in Figure 3 would be rated A. E, F, and I according to initial absorption rates but would be rated F, A, E, and I according to the maximum per cent absorbed. For towel evaluation it is felt that maximum figures are useless. This data is incluled, however, since there might be other fabrics, such as diapers, where this figure is of prime importance.

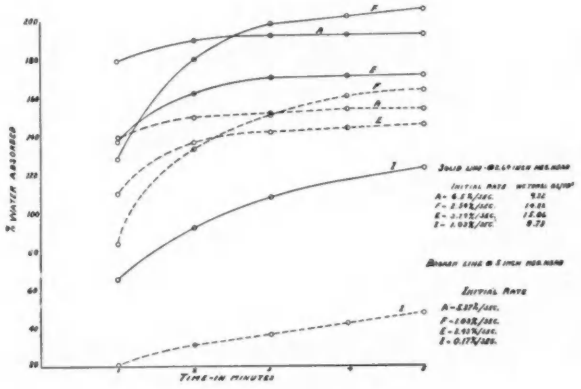


Figure 3
Maximum Valves
Various Towels—Different Negative Heads
#4 Fine Porosity Plate

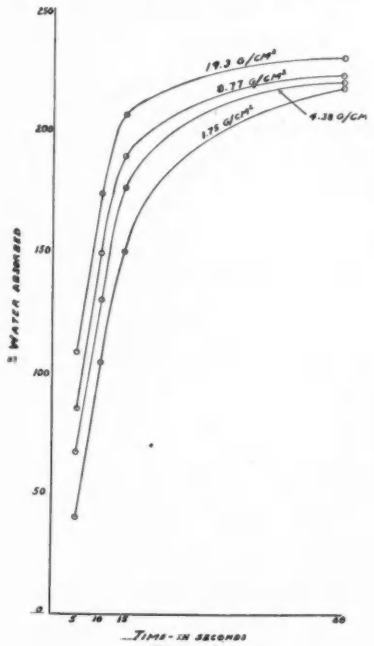


Figure 4
Absorption with Different Contact Pressures
Coarse Porosity Plate
2.64 Inch Negative Head

IV. Variables Which Affect Results

A. ATMOSPHERIC HUMIDITY.—All experiments shown here were made on samples which were conditioned in a standard atmosphere since this eliminated one possible variable. It is not known what the effect of variations in humidity would be.

B. PRESSURE ON TOWEL SAMPLE. Figure 4 shows the results of some preliminary experiments to determine the effect of different contact pressures on the absorption curve. Weights of from 100 to 1100 grams were applied by means of the shot bag to the cloth sample. It is seen that with this range of contact pressures the initial rate of absorption is constant. The effect of increasing weights seems to be that of decreasing the initial time lag. For all subsequent experiments the weight of 1100 grams was used as standard on a towel sample of 3 in. diameter or 45.6 sq. cm. area.

C. EFFECT OF SAMPLE SIZE IN RELATION TO PLATE SIZE.—The towel specimen should be as nearly of the same size as the plate as possible. If the towel specimen is appreciably smaller than the porous plate, the initial rate of absorption is increased with decrease in sample size. This is probably due to the fact that the capillary channels outside of the sample are supplying water to the cloth while water is also being supplied through the capillary spaces immediately under the cloth. This has the same effect as decreasing the resistance to flow of the whole plate.

D. EFFECT OF WATER TEMPERATURE.—Since the amount of water absorbed in unit time is dependent to some extent on the flow properties of the

TABLE I

EFFECT OF WATER TEMPERATURE ON ABSORBENCY

#4 Fine Porosity Funnel—Standard Towel A—Avg. of 5 Determinations

	% Water Absorbed			
	5 sec.		90 sec.	
	At Recorded Temp.	Corrected to 70°F.	At Recorded Temp.	Corrected to 70°F.
Cold Group (14.5-17.5°C.)	41	46	206	232
Intermediate Group (1.98-20.5°C.) ..	43	44	209	218
Warm Group (21.2°-28.5°C.)	51	48	210	197

plate and since the amount of flow through the plate is dependent on the fluidity of the water, it would be expected that absorbency would vary directly with the fluidity of water at different temperatures. Only a few experiments which are tabulated in Table I have been made to show this trend. The bulk of work was done with water temperature controlled at 70°F.

It thus seems that temperature variations affect the initial rate but not the maximum amount absorbed.

E. EFFECT OF NEGATIVE HEAD VARIATIONS.—The negative head used in the system, varies the degree of wetness of the porous plate and also the force which the capillaries of the towel have to overcome to absorb water. At zero negative head the plate has a slight film of water over the whole surface and the initial absorption with an absorbent towel takes place so rapidly that it is difficult to measure the rate. The use of different negative pressure heads slows the absorption so that the rate in the initial part of the curve can be more readily determined.

Figure 5 shows the effect on the initial straight line absorption rates of variations in negative head with towels of widely different absorption characteristics. These readings were made with a fine porosity plate. Figure 6 shows determinations made on some of the same towels with a coarse porosity plate.

It can be seen that the majority of these graphs show enough deviation from a straight line to suggest a hyperbolic shape. A formula has not yet been derived which will enable results at one negative head to be predicted for a different negative head. However, the ratings of the towels at any negative head and with either funnel would remain in the same order.

It must be borne in mind when using any numerical results in evaluations that the ratios between the absorption rate values of different towels at one negative head will not be the same ratio as that found at another negative head. For example, between towel E and NLG in Figure 5 the ratios at different negative heads would be:

	Negative Head				
	20"	15"	10"	5"	2.64"
Ratios-Absorption Rates—Towel E to NYG.....	Inf.	3.55	2.13	1.77	1.53

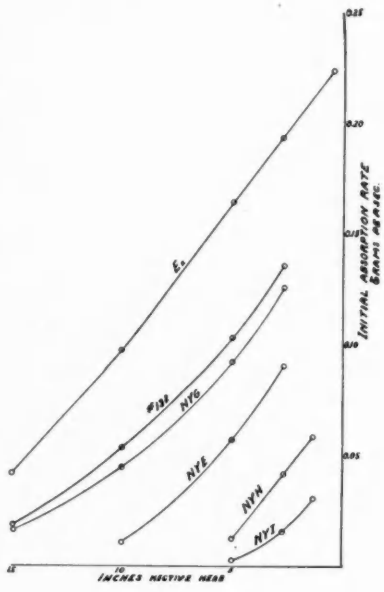


Figure 5
Initial Absorption Rates at Different Negative Heads
#4 Fine Porosity Plate

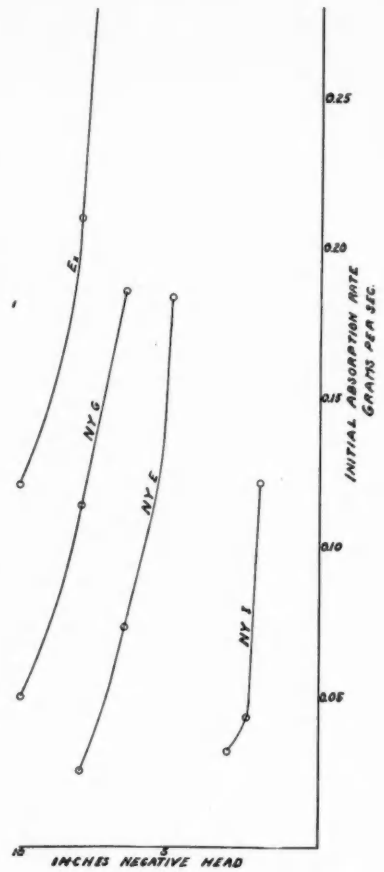


Figure 6
Initial Absorption Rate at Different Negative Heads
#2 Coarse Porosity Plate

F. EFFECT OF FUNNEL RESISTANCE.—By far the greatest variable and the most difficult to control is that of funnel resistance. Commercially available fritted plates of the same designated porosity vary too much from one another to give reproducible results.

A comparison between Figures 5 and 6 will show that when plotting negative head versus initial absorption rate for different towels but with the same funnel, the slope of the curves will be generally the same. However, as the funnel resistance decreases, the slopes of these curves increase, showing that the funnel resistance is a main factor in the angle of slope obtained.

It has been found that in order to slow the initial absorption rate down enough to be measurable with a towel of good absorbency a plate commercially designated as of fine porosity is most suitable. It could be reasoned that a coarse porosity plate with a great negative head would produce the same effect. However, the limit to the negative head which can be put on a coarse plate before it sucks air through the plate is much less than that which can be used with a fine plate. Also as shown between Figures 5 and 6 the effect of a small error in measuring the negative head would be magnified more with a coarse plate than with a fine plate.

To even get reproducible results with the same porous plate the following precautions must be taken.

1. *Frequent Cleaning of the Plate*

It has been found that a porous plate will slowly clog either from lint or algae or both. It is advisable to check the resistance of the plate at frequent intervals by timing the rate of water flow through it under definite positive pressure heads. (See Appendix II). When the resistance of the plate is found to have changed appreciably from its initial value, it should be removed from the apparatus and thoroughly cleaned with chromic acid.

2. Insuring Thorough Wetting of the Plate

If an initially dry plate is connected into the apparatus, it will be found that reproducible values will not be obtained for some time. This is most likely due to air trapped in the plate capillaries. Therefore, when working with a plate which has been dry, it is necessary to force through the plate for several minutes before making absorption measurements, as recommended in Paragraph IIB (1).

V. Reporting Results

For routine work in reporting the initial rate of absorption, a capillary scale range of 20-50% moisture absorbed is recommended. To know wherein this range lies in terms of distance the following formula can be used:

Let a = Calibrated Grams of Water per 1 Inch of Capillary Tubing
Let b = Weight of Cloth Sample

$$\text{Then Inches of Scale Equivalent to 20\% Absorbed Water} = \frac{b}{5a}$$

$$\text{And Inches of Scale Equivalent to 50\% Absorbed Water} = \frac{b}{2a}$$

$$\text{Let c = Inches Between 20 and 50\% Moisture Absorbed} = \frac{b}{2a} - \frac{b}{5a}$$

With the desired interval (c) determined, the time required for the passage of water between these points is determined, and recorded. This may be reported as

$$\text{Rate in Grams of Water per Sec. for Specimen Area} = \frac{a \times c}{t}$$

$$\text{Rate in Per Cent Water per Sec. on Specimen Weight} = \frac{a \times c \times 100}{t \times b}$$

$$\text{Rate in oz. of Water per Sec. per Sq. Yd. of Sample} = \frac{a \times c \times 100}{t \times b} \times \text{Sample Wt. in Oz. per Sq. Yd.}$$

With these results there should also be recorded the negative head and the particular funnel used.

As cautioned in Section IV-E these rates should be used only to grade different towels, since at a different negative head the ratios between the rates will not be the same.

APPENDIX I

A Suggested Timing Device

For routine work where the rate of absorption between 20-50% water absorption is desired a stopwatch is sufficiently accurate. However, if a more detailed study of the absorption phenomenon is desired in rates at succeeding 10% moisture absorption or smaller increments a more accurate timer is needed, one capable of measuring a number of successive times. The following device has been found convenient and more accurate than a battery of stopwatches for this purpose.

It consists of an electric clock motor which turns one revolution per minute. This drives a small drum of 30 inch circumference. The drum is wrapped with paper and a recording pen rides on the paper. Thus 1/20 of an inch on the paper equals 0.1 sec. As an absorption experiment is started an operator flicks a lever attached to the pen as the meniscus passes successive one inch increments on the capillary tube. Thus a picture of the absorption rates over one inch capillary increments up to a total time of one minute can be obtained. The position of the pen on the paper can be shifted so as to obtain a number of graphs on the same strip of recording tape.

APPENDIX II

Calibrations

A. DETERMINATION OF ZERO POINT ON BURETTE (U).—This is the point (3) on the burette at which the water level will come to rest when the plate is removed from the circuit by closing Stopcock *(E);* with Stopcock *(B)* open; and Stopcock *(A)* open from Burette *(U)* to Measuring Tube *(T).* With Measuring Tube *(T)* full of water and the level in the Burette at near the zero point (3) water is drained through Stopcock *(C)* until the level in the Burette is slightly below the zero point (3). Stopcock *(C)* is then closed and when the meniscus in the Measuring Tube *(T)* stops moving, the position of the water in the Burette is taken as the Zero Point (3).

B. CALIBRATION OF MEASURING TUBE *(T).*—This may be done easily by shutting the funnel from the circuit with Stopcock *(E).* Then with water in the burette at some point higher than the zero point and the water in Measuring Tube *(T)* at some intermediate point such as (2), water can be admitted to the measuring tube by opening stopcock *(A)* into the circuit. The number of cc's of water admitted from the Burette per inch of Measuring Tube can thus be measured.

C. CALIBRATION OF PLATE RESISTANCE.—As a check on the plate resistance and to determine when the plate needs cleaning, the rate of water flow through the plate under a definite positive pressure head can be measured using the apparatus as routinely set up with only a slight modification.

For measuring plate resistance a constant head of water at 70°F. is maintained above the porous plate by means of a Water Supply Tube *(G)* and a Suction Tube *(H).* To determine this effective head, Stopcocks *(B)* and *(C)* are closed; Stopcock *(E)* is open; and Stopcock *(A)* is open to the funnel.

The water level in the Burette *(U)* will rise to point (4) which is level with the constant water head. The difference between zero point (3) and point (4) is the effective positive pressure head. To measure the rate of water flow through the funnel, Stopcock *(A)* is closed; Stopcock *(B)* is opened and water is drained from the system by means of Stopcock *(C)* until the position of the meniscus in the Measuring Tube *(T)* is at (2). Now by closing Stopcock *(C)* and timing the passage of the meniscus over a convenient distance (10 inches) of the capillary tube the rate of water flow through the plate under a known pressure head can be determined.

To provide a constant flow figure for the plate irrespective of the effective head used the following formula can be applied.

Let

(a) = Calibrated grams of water per inch of capillary tubing.

(c) = Inches tubing on which timing is made.

($\bar{h}$) = Effective head in centimeters.

(t) = Time in seconds for observed flow.

1/r (analagous to electrical conductivity) = flow in grams of water per second per 1 cm. positive pressure head.

$$\text{Then } 1/r = \frac{a \times c}{h \times t}$$

Acknowledgment

The authors acknowledge the helpful suggestions of Edmund M. Buras of the Southern Regional Research Laboratory in connection with development of this apparatus.

References

1. LaRose, P. "The Water Absorption by Towels", "Amer. Dyestuff Reptr. 31, 105-108, 123-124 (1942).
2. Kettering, J. "The Determination of Rate of Water Absorption of Light Weight Cotton Fabrics"—"Amer. Dyestuff Reptr., 37, 73-75 (1948).

• PATENT DIGEST •

PAUL WENGRAF

Dyeing Nylon—Sparingly Soluble Acid Dye Salts C, 2, 07

U. S. P. 2,459,831
(Du Pont, McGrew, Sharkey, January 25, 1949

Nylon used to be dyed with water-soluble acetate dyes which are of insufficient fastness to washing. Acid or direct dyes which are better in this respect have the drawback of showing large differences in uniformity. The present invention has the object of applying acid dyes by a method resulting in absolutely even dyeings. The principle is in that the concentration of the dye solution is permanently maintained in a very dilute state by transforming the otherwise highly soluble acid dye into a difficultly soluble salt of an alkaline earth. Dissociation of these salts is so much repressed during the dyeing process, that the dye anion concentration is at least 0.1 per million and not higher than 50 p. per million calculated on the weight of the dyebath. This method can be carried out in practice by precipitating the acid dyestuff solution with an alkaline earth chloride, preferably $BaCl_2$, adding a small amount of (acetic) acid and continuously stirring this dyebath during the dyeing operation. A nylon fabric is immersed for an hour in this bath which is warmed to 50-100°C. The dye anion migrates slowly into the fiber and at the same time gradually other portions of the Ba-dyestuff salt dissociate slightly to be absorbed by the textile material until the whole dyebath is completely exhausted and becomes colorless. The process is based on retarding the dyeing process by very simple means. It is emphasized that the dyestuff salts, used in this process, are of such low solubility that even an excess of the original dyestuff will not increase the concentration of the dyestuff-anion beyond the upper limit of dissociation, i.e., 50 p. per million of the weight of the dye liquid. According to an example, a blend of acid dyestuffs is dissolved in water. A 5% solution of barium chloride or calcium chloride, dissolved in dilute acetic acid is stirred in, whereby the dyestuff salts separate, leaving a colorless supernatant liquor. A knitted nylon fabric is introduced and the bath is stirred while heating it to 80°C. After agitating the material for one hour it is uniformly dyed and no streaks, spots or non-leveled fibers could be detected.

References cited by the Patent Office, among others:

U. S. Pat. 1,873,628, 1932 (Gen. Aniline Works): describes the manufacture of monoazodyes useful for acid dyeing and forming insoluble calcium, or barium-lakes. No suggestion regarding dyeing fibers from suspensions of this type of lakes could be found.

B. P. 22,097, 1908 (Cassella); refers to a special wool dyeing method with chrome dyestuffs (Anthracene Chromate Brown), to which sodium dichromate and an ammonium salt are added. The ammonium salt dissociates as a latent acid agent in the boiling dyebath whereby the chromium lake is gradually formed. The Cassella patent substituted alkaline earth salts for the ammonium salt, thus effecting a slower dissociation. This process differs from the patent discussed above in that the dyestuff-, barium -(or calcium-) lake is generated and gradually dissociated in the dyeing operation.

Creping and Dyeing of Acetate Cellulose Fabric Combined F, 4, 01

U. S. P. 2,460,875
(Celanese Corp. of Amer., Croft-Hindle, February 8, 1949)

Textile materials, composed of highly twisted yarns of cellulose acetate, are subjected to a creping operation in a special way. The main feature of the patent is in a high speed procedure which can suitably be combined with a fast dyeing process with dyestuffs which are by themselves not generally used for dyeing acetate fibers. The specification mentions especially dyes fast to washing, light and acid fading, for instance, acid dyes and Indigosols. Reference is made to former patents assigned to the same company wherein acetate of cellulose is dyed with dyes of different groups, dissolved in organic solvents which act partly as swelling agents (see REPORTER 1948, 397 and 243). This method is combined with a treatment preceding the usual boil-off or scouring passage. It has been found that the rate of creping may be increased by padding the fabrics, containing the twisted yarns in an aqueous organic liquid, comprising at least 70% of a lower alcohol. Creping is effected thereby in a very short time; moreover none of the usual crepe-promoting agents is required in the boil-off bath which consists of an aqueous solution of a detergent (the examples mention 0.5% lauryl alcohol sulfate solution). Another important part of this process is the manner of *simultaneously creping and dyeing* this kind of fabric. By dissolving one of the dyes of the acid (or Indigosol or Algosol) class in the diluted alcohol used in the pre-treatment, a deep shade is obtained. Since many dyestuff classes are alcohol-soluble, it is quite possible to select for this process the types most resistant to fading: the dyes become faster than those obtained by first creping and thereupon dyeing. An expedient creping and dyeing process is disclosed in one of the examples: a solution of Alizarine Sky Blue B and Cloth Fast Yellow 2 GC in about 70% ethanol, to which sodium thiocyanate is added as a swelling agent, is used for padding an acetate fabric, woven from high (steam) twisted yarns. The fabric is continuously passed through this solution maintained at 27-30°C., slightly washed and run through a 0.5% Gardinol (sodium lauryl sulfate) solution at 98°C. This passage takes about 10 min. Cross-printing with other suitable printing pastes is within the scope of the invention. Indigosol-type dyes applied from alcoholic solutions have to be developed in nitrite-sulfuric acid before entering the boil-off (scouring) bath.

References cited by the Patent Office, among others:

U. S. Pat. 2,344,973 (Celanese—H. Dreyfus): describing dyeing acetate of cellulose with a dyestuff dissolved in a lower dilute alcohol (concentration at least 70%).

U. S. Pat. 2,118,840 (Dreyfus): threads of cellulose acetate, highly twisted under the influence of hot water, are subjected to a shrinking action in a bath containing lower alcohols, ketones and the like.

U. S. Pat. 2,089,241 (Celanese): crepe yarns are impregnated with a so-called creping-aid or creping-assistant, consisting of plasticizers, surface active agents, soaps, etc.

Other reference:

The same company published, as mentioned above, methods for dyeing cellulose acetate with alcohol solutions. These solutions act as swelling agents, promoting the dyeing process. See also Ger. P. 638,303 (Ciba) which claims that cellulose acetate, when in a freshly swollen state, shows affinity for direct and acid dyes. The present invention, although based on this reaction, offers the innovation of a high speed creping process, effected simultaneously with a high speed dyeing process.

(Concluded on page 424)

Proceedings of the
American Association of Textile Chemists and Colorists

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May 16, 1949

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CLEMSON COLLEGE
BRADFORD DURFEE TECHNICAL INSTITUTE

Retirement of Professor Camp

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

April 18, 1949

Prof. E. W. Camp
Textile Department
Alabama Polytechnic Institute
Auburn, Alabama

Dear Prof. Camp:

We have just learned of your plans to retire next month from the field of textile education and training. In behalf of the American Association of Textile Chemists and Colorists, an international organization comprising more than 6,000 members who work in the field of textile wet processing and allied activities, I am privileged to express our felicitations and our gratitude to you for the life-time service you have rendered to the textile industry. It will always be an inspiration to everyone in this industry who knows you or who knows of the outstanding contributions you have made to the progress of this industry through your pioneering in the field of textile education, and through the up-grading of the level of management ability which your work in the training of men for this industry has produced.

You are relinquishing active participation in our activities, but your impress upon us will last so long as there is a textile industry. Equally significant is the wholesome influence and inspiration you have left in the mind and character of every student whose life you have touched; and not the least of your treasures is the knowledge of the sincere affection and respect in which you will always be held in the memory of your "boys."

We are honored by the privilege of saluting you and your fine and devoted life of unselfish service and accomplishment. The fact that you did not build with brick and stone does not any the less constitute you a great builder. You have wrought with the minds and hearts of men, attuning them to greater achievement, a happier belief in the worthiness of their occupation, and a prouder knowledge of their individual value to society.

Sincerely yours,
H. F. HERRMANN, *President*

—♦ ♦—

Report of Philadelphia Section

A MEETING of the Philadelphia Section was held on April 22nd at Kugler's Restaurant in Philadelphia.

Vice-Chairman Richard B. Stehle conducted the business part of the meeting during which he introduced Elmer C. Bertolet, Fred L. Nuttall and John McCoy as guests of the evening.

John W. Jordan announced plans for the Annual Outing to be held at the Whitemarsh Valley Country Club on June 10th. It is planned to televise over WFIL-TV part of the Golf Tournament and the Hole-in-One Contest. A large floor show and many prizes, plus a full day of games and contests, are planned to make it a very enjoyable day.

W. O. Neeb, Chairman of the Program Committee, introduced Arthur H. Razee, Rumford Division of Heyden Chemical Corp. who spoke on "Polyphosphates." Following a discussion period on this subject, a motion picture film on "The World Series of 1948" was presented by the Philadelphia Athletic Ball Club.

The dinner preceding the meeting attracted 133 members and guests while the technical session was attended by 165.

Respectfully submitted,
THOMAS H. HART,
Secretary

—♦ ♦—

Report of Piedmont Section

THE Spring Meeting of the Piedmont Section was held on April 2, 1949, at the Robert E. Lee Hotel in Winston-Salem, N. C. At 10:00 a.m. the Research Committee met to report the progress of pending investigations and to make plans to facilitate their completion.

An Officers' Luncheon was held at 1:00 p.m., at which time a general discussion was followed by a meeting of the Nominating Committee.

The Technical Program was opened at 3:30 p.m. Charles A. Seibert spoke on "Washfastness and How it may be Described and Measured." J. A. Crumley spoke on "Hosiery Colors and Dyeing."

Western New England Section

Shown above is a portion of the group that attended the meeting of the Western New England Section on January 14th at Shelton, Connecticut. The speaker (arrow) was Dr. Herman Mark, Brooklyn Polytechnic Institute.

The Banquet was scheduled at 7:30 in the evening. The after-dinner speaker was W. H. Neal, Senior Vice-President of the Wachovia Bank & Trust Co., Winston-Salem, N. C., and his message was "Where Do We Go from Here?" The Lion's Club Quartet entertained.

Golf was enjoyed by many at the Forsythe Country Club.

The meeting was attended by approximately 250 members.

Respectfully submitted,
EDWIN A. BRIGGS,
Secretary

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CALENDAR

SOUTH CENTRAL SECTION
Meeting: May 21 (Patten Hotel, Chattanooga).
WESTERN NEW ENGLAND SECTION
Meeting: May 20
Outing: June 24
NEW YORK SECTION
Outing: June 17.
PHILADELPHIA SECTION
Meetings: May 20, September 16, November 11 (Kugler's, Philadelphia).
Outing: June 10.
PIEDMONT SECTION
Meetings: June 24, 25, 26 (Ocean Forest Hotel, Myrtle Beach, S. C.), November 5 (Charlotte Hotel, Charlotte, N. C.)
HUDSON-MOHAWK SECTION
Meetings: May 20, September 16, November 18.
Outing: June 17.
PACIFIC COAST SECTION
Meetings: May 17 (Portland).
RHODE ISLAND SECTION
Meeting: May 20
Outing: June 24
MID-WEST SECTION
Outing: June 18 (Lake Lawn, Delavan, Wis.).
NORTHERN NEW ENGLAND SECTION
Meeting: May 20 (Andover Country Club).
COUNCIL
Meetings: June 9, Sept. 9, Dec. 9.
RESEARCH COMMITTEE
Meetings: June 9, Sept. 9, Dec. 9.
NATIONAL CONVENTIONS
1949: October 13 to 15, Chalfonte-Haddon Hall, Atlantic City.
1950: Portsmouth, N. H.
1951: October 18 to 20, Statler, New York.

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ONE HUNDRED AND SIXTY-SIXTH COUNCIL MEETING

THE Council held its 166th meeting in the Hotel New Yorker, New York, N. Y., on Friday morning, March 25, 1949. Present were President Henry F. Herrmann, presiding; John N. Dalton and C. Norris Rabold, Vice Presidents; William H. Cady, Carl Z Draves, Thomas R. Smith and P. J. Wood, Past Presidents; J. Robert Bonnar, Chairman of the Research Committee; Edward S. Chapin, Elmer E. Fickett and George O. Linberg representing Northern New England; Alden D. Nute and Raymond W. Jacoby representing Rhode Island; Harold H. Taylor representing Western New England; Herman E. Hager, William A. Holst, Jr. and Herman E. Wilde representing New York; Albert E. Herrmann, Jr., representing Hudson - Mohawk; Walter F. Fancourt 3rd, Onslow B. Hager, M. H. Klein, Lloyd O. Koons and Frederick V. Traut representing Philadelphia; Pelham Eugene Smith representing Piedmont; A. Kempton Haynes and Robert W. Philip representing Southeast; Joseph H. Jones representing Mid-West; Kenneth H. Barnard of the Convention Committee; Arthur W. Etchells of the Technical Program Committee; Patrick J. Kennedy of the Intersectional Contest Committee; Edwin R. Laughlin of the Colour Index Committee; Leonard S. Little of the Corporate Membership Committee; Paul J. Luck of the Publicity Committee; Harold W. Stiegler, Research Director; Herman P. Baumann; and Harold C. Chapin, Secretary.

The Secretary's report of the 165th Council meeting and financial report of March 15, and the Treasurer's report of March 16, were accepted.

A resolution in memory of Dr. Louis A. Olney, naming him the Founder of the Association, was voted, transmitted to his family, and sent to the *Reporter* for publication. It was voted that the library of the Association be known as the Olney Memorial Library, and that gratitude be expressed to the family of Dr. Olney for the bequest by him of his technical library and $500 for its maintenance. Succeeding Dr. Olney, Percival Theel was appointed Chairman of the Publications Committee, William H. Cady, Chairman of the Colour Index Committee, and Thomas R. Smith, a member of the Appropriations Committee.

For the Research Committee Mr. Bonnar reported resumption, in Lowell, of work on the test for flame resistance, recently withdrawn from listing as a standard method. The Committee which had been studying the proposal of an Association pilot plant was preparing its report. A committee on desizing would be organized if there seemed to be sufficient interest; also a committee on water resistance of wool.

Mr. Etchells reported on the technical program for the Atlantic City convention; and Mr. Kennedy on the Intersectional Contest, stating that ten Sections would probably present papers. Mr. Fancourt stated that there would be a large group of exhibits, with ample space for convenient arrangement. For the convention of 1950, under auspices of the Rhode Island Section, Mr. Jacoby reported change of place to Portsmouth, N. H.

Mr. Little reported for the Corporate Membership Committee. Reporting for the Publications Committee, the Secretary stated that the 1949 *Year Book* had gone to press, and the new *Analytical Methods for a Textile Laboratory*, nearly through proofs, would be out in June.

Mr. Cady and Dr. Laughlin reported on the *Colour Index*, and received approval for issuing the first questionnaire on dyestuffs to manufacturers.

It was voted, "Whereas, the Nominating Committee must present new names for the three offices to be filled at the election next Fall, because the present incumbents will have served three years consecutively and will therefore be ineligible for reelection; therefore be it resolved, that it is the judgment of the Council that whenever such a situation arises, at least two candidates should be nominated for each office to which a new man must be elected."

It was voted that invitations be accepted for exhibits by the Association in New York, in the weeks of June 6 and 20, in connection with the Textile Wet Processing Exhibition and a convention of the National Retail Dry Goods Association.

SECRETARY'S FINANCIAL REPORT—MARCH 15, 1949

	Applications	*Dues, Regular & Reinstate*	*Dues, Corporate & Sustaining*	*Miscellaneous*	*Totals*
Received and transmitted to Treasurer					
August 1, 1948 to Jan. 17, 1949	$2,944.00	$29,894.00	$31,662.50	$10,612.14	$75,112.64
January 17 to March 15,1949	927.50	5,229.50	10,215.00	2,504.25*	18,876.25
Totals in fiscal year to March 15	3,871.50	35,123.50	41,877.50	13,116.39	93,988.89
Leaving deposited by Treasurer with Secretary,					9,624.60

*Miscellaneous items,

Dividends	$ 39.80
Rebate, fire insurance	8.77
Rebate, Rain Tester	130.00
Reporters and reprints	9.00
Dry cleaning kit	3.00
Year Books	675.41
Analytical Methods	4.00
Crockmeters	718.00
Crock cloth	271.50
Moth cloth	140.75
Water test apparatus	105.50
Dyed standards	54.00
Knitted tubing	62.30
Gas fading units	16.00
Buttons	7.50
Color transfer charts	50.00
Colour Index	210.00
	2,505.53
Less Bank Charges	—1.28
	2,504.25

The Publicity Committee was asked to render a report recommending a general policy on such exhibits.

For Professor Lindsay's Committee on Student Awards, Mr. Wood reported that the first awards would be made this spring, in those institutions having Student Chapters of the Association. The first books awarded would be the new *Analytical Methods for a Textile Laboratory*. Book plates, for both this book and the *Year Book* covered by the award, were being made.

H. P. Baumann was introduced by the President, to present a proposal that the Association receive sealed communications to be retained five years before opening and publishing.

Elected to Corporate membership were the General Electric Co., the Hilton-Davis Chemical Co. Division of Sterling Drug Co., Nu Dye and Finishing Co., and Valley Color and Chemical Co. Presented by Mr. Dalton for the Committee on Membership and Local Sections, each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided no objection be received meanwhile by the Secretary.

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T. S. Blackwood
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L. H. Burgoff
J. E. Campbell
H. P. Clark
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P. J. Cotty
R P. Cox
J. M. Culp
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J. F. Dube
J. L. Dudley
H. N. Dyer, Jr.
W. J. Ellwood
V. V. Fedorov
E. A. Ferrante
R. D. Fine
R. K. Fisher
R. Garber
S. Giers
Mrs. E. S. Glennon
G. A. Harris
R. T. Harris
A. Heinz
C. J. Hurtz
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M. H. Johns
R. J. Johns
S. Kaplan
R. Kriewall
J. W. Lane
J. U. Little
H. E. Lovern
E. W. Lowe
H. Luber
E. Malouf
J. D. Matos
L. E. McCracken
W. H. McGinty
W. J. McLaughlin
A. Molins
O. Neggia
B. R. Newcomb
E. I. Noble
J. E. Norton
A. G. Plumb
E. B. Plummer
F. J. Potter
T. R. Quinn
E. V. Salzmann
T. J. Sarandria
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F. M. Sell
C. Silverman
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L. D. Erbstein
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T. C. J. Holt
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W L. Prince, Jr.
D. Rockway
J. A. Roux
R. E. Sebra
R. M. Shapiro
E. C. Sherburne
R. A. Simmons
R. L. Ward

Transferred to Senior Membership were:

E. H. Hart
R. E. Mann
W. A. Stickney

Respectfully submitted,
H. C. CHAPIN
Secretary

Atlantic City Convention

October 13-14-15

"Education through Association"

EMPLOYMENT REGISTER

This column is open for four insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers, who can obtain further information from the Secretary.

49-8

Education: R. I. School of Design, graduating in June, 1949.
Experience: One summer, research asst.; editor of college year book; war service.
Age 25; married; references.
4-4, 4-18, 5-2, 5-16

49-10

Education: Bradford Durfee Technical Institute, dyeing and finishing, graduating in June, 1949.
Experience: Summer in dyeing and finishing plant.
Age 22; married; references.
4-18, 5-2, 5-16, 5-30

49-11

Education: B.T.C., Lowell Textile Institute.
Experience: Superintendent of Dyeing and finishing, wool and other fibers.
Age 37; single but with dependents; references; New England preferred.
5-16, 5-30, 6-13, 6-27

All correspondence regarding the Employment Register should be addressed to the National Secretary

North Carolina State College Student Chapter

A T at meeting attended by about thirty students and professors on the evening of April 6th, Charles B. Ordway of Burlington Mills spoke on "The Use of Synthetics in Dyeing and Finishing."

Respectfully submitted,
J. R. STILLWELL, *Secretary.*

Rhode Island Section—

SOME ASPECTS OF THE CHEMICAL CONTROL OF WOOL SHRINKAGE*

JOHN M. GOULD
The Barre Wool Combing Company, Ltd.

IN some fashion, we are all acquainted with the unique property of wool which makes it susceptible under certain conditions to "fulling" or "felting" shrinkage. As a worsted or woolen finisher, we would turn this property to advantage in consolidating our fabric to produce desirable qualities of texture, drape and handle, or in the production of durable apparel or mechanical felts. As consumers, we may be unmindful of the usefulness of this peculiarity. Mother resents the perversity which causes the carefully knit sweater to change dimensionally upon laundering in inverse relation to the dimensional change in her child. Father, too, feels at least irritated when a favorite hunting shirt or pair of socks, washed two or three times, becomes of necessity the property of a ten year old son.

Multiplying this situation by some millions produces the problem faced by the army during the last war. By the war's conclusion, some solution had been found to the extent that a whole industry had been converted to treating about 8,000,000 pairs of army socks per month. This was done by a batch chlorination process, with the result that the average life of these items was more than doubled.

Subsequently, and as a result of this success, a large number and variety of processes for the production of shrink resistant wool have been offered commercially in this country. In this we have lagged behind the British, whose dry chlorination process was a commercial reality before the war.

Most available information on shrink resistant wool consists of the technical papers of more or less fundamental nature which have appeared in the *Dyestuff Reporter* and similar journals during the past few years, together with patents and government reports. This technical information is supplemented by enthusiastic promotional material in trade journals and popular magazines.

In deciding how I might best presume upon the next thirty or forty minutes of your time, it seemed most profitable to strike a middle course. We do not have any fundamental research to report. We have no desire to abuse the hospitality of this platform for advertising purposes. We would like, however, to emphasize some simple definitions, to briefly review the broad field of wool shrink resistant treatments, and particularly to tell what we believe you—and the consumer—may expect from at least one such treatment. This is based upon our experience with a process which has successfully treated some hundreds of thousands of pounds.

Definitions

First to definitions. In a recent meeting before the New York Section of this Association, Edwin Wilkinson of the National Association of Wool Manufacturers gave an excellent report covering the activities of the Federal Trade Commission in this field *(1)*. In that address he stated he was probably the only person present who did not know the difference between potential and residual shrinkage. I am in good company, for I do not know the difference between potential and residual shrinkage. At the risk of being considered somewhat elementary, however, I would like to define two types of shrinkage which I do know, as undoubtedly does each one of you. These are "relaxation shrinkage" and "felting shrinkage". Relaxation shrinkage is the dimensional change which takes place when a fabric is thoroughly wet out after fabrication. This type of shrinkage results from release of strains set up in the fiber during manufacturing operations. Relaxation shrinkage is common to most fibers. The well-known "Sanforizing process" and the so-called "London shrinking" or "sponging" treatments have been devised to minimize this in cotton and wool textiles respectively. Because of the great elasticity of wool it is particularly important to minimize relaxation shrinkage in knitted wool goods by avoiding overboarding. The reason is that no amount of wool shrinkage control can guarantee the dimensional integrity of garments boarded rather than knitted to size.

The second type is the "fulling" or "felting" shrinkage to which we have referred, which is peculiar to wool and a few other animal fibers. We are all familiar with the effect, though we may be less certain of its precise cause.

Of a number of theories offered in explanation, two at least seem to fit the observed facts satisfactorily. One has to do with wool's so-called "contractile tendency," that is the unbalanced elastic forces between the cortex, or inner portion of the fiber, and the shell-like outer surface or cuticle *(2)*. These cause the fiber to twist and curl when heated in presence of moisture. This may well explain the intertwined, entangled mass of fibers which characterize felts or heavily "fulled" fabrics.

Another explanation is the interlocking scale theory which attributes felting to an actual meshing or interlocking of closely adjacent scales. More tenable is the theory that when wool fibers are subjected to mechanical action, there is a migration of individual fibers in direction from tip to root, which consolidates the fabric. This migration is caused by difference in co-efficients of friction of fiber surface, which are greater "tip to root" than in the reverse "root to tip" direction (3). It is over-simplification of fact to call this the "shingles on a roof" or "rachet" theory, but the effect can be demonstrated by this simple mechanical analogy.

I have here a gimmick simulating a fiber with scalar surface, constructed from a wood dowel and rubber tubing.

If we subject this magnified and exaggerated fiber to rubbing action, we see that it moves consistently in direction relative to the root end.

This theory has been reinforced through development of techniques for measuring these coefficients of friction *(4, 5)*. It has been shown that if we can reduce the directional friction effect, thus reducing the tendency to migrate, we also reduce the area shrinkage of fabrics constructed from fibers so treated.

The effect is exhibited by this second model, similarly constructed, but with nearly equal frictional forces in both

* Presented at meeting, Rhode Island Section, November 19, 1948.

directions. Subjected to the same rubbing action, it shows that the migrational tendency is almost entirely eliminated.

We might assume that this result has been achieved by reduction of "against scale" friction, but this seems not the case in at least one successful treatment. It appears instead, that "with scale" friction has been increased.

In other words, not only are the two coefficients of friction equalized by such treatment, but the average coefficient of friction is increased as compared with the untreated fiber. This is emphasized, because it provides an explanation for the observed fact, that spinning qualities and tensile strength of yarns produced from Harriset treated tops are appreciably improved in comparison with those from untreated tops.

Methods of Controlling Shrinkage

Most proposed methods for controlling shrinkage, with possible exception of resin treatments, have approached the problem through modification of surface friction. Even nonchemical approaches seem to have had the same objective. Among these may be mentioned use of proteolytic enzymes. So far as I know, this has met with little commercial success, probably because the reaction is of uneconomic duration, and there is chance for some degradation of fiber cortex.

A novel mechanical approach is the proposal to mill specially designed fabrics with an oil suspension of certain abrasive materials *(6)*. The purpose is to attain uniform frictional effect by process of attrition. While of theoretical interest, such a process would seem cumbersome and of only limited practical application.

Having thus digressed from our subject, chemical methods of shrinkage control, we must mention resin treatments. These of course involve chemicals; but they are beyond the scope of our discussion for the reason that they are applicable to wool only at an advanced stage of fabrication and therefore do not compete with chemical methods in the production of what is actually a new fiber.

Chemical Methods

Among chemical methods for attaining shrink resistance in wool are those using alcoholic solutions of caustic alkali, sometimes with an inert diluent such as Stoddard solvent or similar petroleum derivative. The diluent acts as a throttle on the reaction rate, which under uncontrolled conditions proceeds rapidly, causing uneven treatment and local areas of excessive fiber damage. One such process is so sensitive to variation in moisture content from the optimum, that a spot of water on stock entering the system causes almost complete local destruction of fibers. The method involves expensive reagents, elaborate equipment for handling volatile inflammable material, and tremendous control problems, so that it has not secured a foothold in this country.

Time does not permit more than mention of other reagents applied experimentally to the problem. Such for instance is sulfuryl chloride, which did reach limited commercial use. It was abandoned, probably because of severe reaction upon personnel as well as upon fiber being treated.

Finally we come to the various halogenation processes. To the best of our knowledge, all commercial chemical methods now in use for producing shrink resistant wool are in this category. In fact, we may restrict this to those involving chlorine.

Most prominent in Britain is the Wool Industries Research Association process referred to previously, which uses dry gaseous chlorine. Simple in concept, the method essentially involves evacuating the carefully conditioned top, yarn, piece goods or garments, in a large air tight chamber. Following evacuation, chlorine gas is admitted, and the stock remains in contact with this for twenty minutes. The vessel is again evacuated to remove chlorine, then flushed with air and opened for removal of the treated material. This was the first successful commercial processes, and now has had ten or twelve years of operation.

All other processes involve wet chlorination, variously conducted, under acid or alkaline conditions with or without inhibitors or assistants. These include permanganate, formaldehyde, Chloramine T and others.

Because of secrecy surrounding many of these processes, any generalization is inevitably subjected to exception. Some principles are well established, however. Among these may be mentioned the high oxidation potential of acid chlorine solutions, which are very reactive and unstable. We would expect, therefore, that the rate of reaction of chlorine on wool at low pH would be very rapid; as borne out by available evidence. The effect usually is uneven treatment, and severe damage to the wool as measured in weight loss and increased alkali solubility *(3, 7)*. Mechanical properties are often degraded by acid chlorination, shown by such yardsticks as the so-called 30% index, which is a comparison of energies required to stretch a fiber before and after treatment.

Evidence indicates that minimum fiber damage, greatest ease of control, and maximum resistance to felting are achieved on the alkaline side.

Wet chlorination may be further subdivided into batch and continuous processes. The army sock treatment developed by intensive research of the Quartermaster Corps during the war was a batch process, necessarily limited to hosiery dyeing machinery available *(8)*. Such a process has its limitations. In particular may be mentioned the chance of damaging fiber cortex during the long period that wool is in the chlorinating bath. A continuous process, such as may be applied to tops or pieces, offers opportunity for reducing the time element, in precisely controlled fashion, to the point where only fiber surface is affected, thus preserving to the utmost the desirable properties of wool fiber.

A great practical advantage of a continuous process is the opportunity for continuous control and frequent evaluation of results.

As this audience well knows, the factors which affect the final result in any wet treatment of textile material are many, and not always simple. Wool shrinkage control is no exception. Wools vary greatly in susceptibility to fulling, a mushy Texas behaving quite unlike an equally fine Territory or Australian wool having more character. Differences in fiber fineness have critical effect, with diminished felting tendency as we approach carpet wool and mohair.

Previous history of wool being treated enters into the picture. I am thinking particularly of the scouring or cleaning process, and the type and amount of fiber lubricant applied.

Thus far we have discussed fiber susceptibility to treatment. Equally important is end use. Fabric construction greatly influences the degree of treatment required to make the finished garment dimensionally stable. One would not expect an untreated worsted flannel or gabardine construction to shrink to the same extent under similar conditions as would a knitted sweater or pair of socks.

Dimensional stability means eliminating stretching and loss of resilience, which have been plagues of some methods of treatment. To return to our hypothetical family, I am sure eighteen year old sister thinks her size 36 sweater a poor investment if it expands with washing to a loosely fitting 38, instead of shrinking to a more definitive 35. A satisfactory treatment, therefore, must take into account "end use" as well as history of the stock.

I may seem to have built up the argument that successful shrink-resistance is impossible of attaining, but that is not my intent. Securing desired shrink resistance is not difficult if a process possesses the flexibility necessary for control.

What I am trying to emphasize is that shrinkage control, like matching a color, is not yet a cook book process in which you take 30 lbs. of A, 14 oz. of B, dis-

solve in 300 gals. of water, put in 100 lbs. of stock and go out to lunch with positive assurance that undamaged, shrink resistant wool awaits your return.

Harriset Process

From this point on, it may be difficult to avoid suggestion of bias on my part, if indeed I have not already made some prejudice apparent. I might just as well admit that at the Barre Wool Combing Co. we make wool top shrink resistant by the Harriset process.

About three years ago, we started an investigation to round out the services of a commission combing plant in conversion of greasy wool to white, bleached and colored tops, including solid, mixture, vat dyed, and vigoreaux printed. We wished to add to this service the best available shrink resistant treatment applied to top. I doubt if any then available treatments which had progressed beyond laboratory curiosities were overlooked in that investigation, which included foreign as well as domestic processes. Certain process requirements, including those which I have described, became apparent in the course of that search. The conclusion reached was that only the Harriset process fulfilled the conditions outlined. Subsequent experience has supported that conclusion.

Properties of Shrink Resistant Wool

Among questions most frequently asked about shrink resistant wool are those relating to washability, bleaching and dyeing properties.

As regards washability, let us discuss two methods, hand washing and machine laundering.

First with respect to hand laundering, no wool item is entitled to the label "shrink-resistant" unless it will withstand hand washing under usual conditions of temperature, soap and ordinary care, without shrinking out of size, matting, or becoming boardy or felted in the life of the garment.

What about machine laundering? When made of truly shrink resistant top, most woven goods and some knitted goods can be safely and repeatedly laundered in automatic home washers or sent out for commercial laundering. It should be remembered that there are few more effective fulling mills than automatic washers which fill and empty without interruption of the mechanical cycle. Some wool garments will stand it; others more delicately constructed garments will not. This is equally true when fibers other than wool are involved. The careful housewife does not submit light cotton jersey or nylon hose to such treatment. Many wool articles, particularly knitted garments of loose knit or novelty construction, are not by nature built to take this kind of abuse. More firmly constructed garments, such as most wool socks, can be handled like the rest of the family wash.

Harriset treated garments may be hand washed without qualification. The answer to machine laundering must be qualified. It depends upon the grade of wool, the type of yarn, and above all the construction. The shrink resistant label is not a license to abuse.

The term "washable", applied to shrink-resistant wools, includes also fastness of dyestuffs employed. Certainly no acid dyes customarily employed for the bright blues and pinks of baby shades are fast enough to laundering to warrant the designation "washable" in the consumer's mind.

This situation is not hopeless however. New techniques for applying vat dyes to wool make available shades of good brilliance and greatly enhanced durability.

This brings us to the dyeing of so-called chlorinated wool. A great deal of work has been done on this subject. Reports of results have been misleading to the extent that, in describing chlorinated wool, reference has actually been made to chlorine damaged, rather than to shrink resistant wool. Here, I submit, there may be a great difference.

In support of this statement, I refer to the tremendous amount of work represented by the third prize Intersectional Contest paper of the New York section, presented at Chicago last year, and since published in the *Dyestuff Reporter (9)*. This presented a study of the Dyeing and Fastness Characteristics of Aqueous Chlorinated Wool, based on comparative results from five different processes and a control.

Of the samples tested, all showed a high degree of damage measured in terms of alkali solubility, three of the five to the point where essential wool characteristics were destroyed.

Further examination of data in the same paper indicates that in none of the samples had a useful degree of shrinkage control been approached. Area shrinkage ranged from a low of 15% to a maximum of 55%, the average being 38% after only three relatively mild 25 minute washings in a standard wash wheel. Fabric from two of the five processes under examination actually shrank considerably more than the control in both warp and filling. This comment is not to disparage the quality of investigation supporting this paper, which sets the pace for further useful work in the field. It should be emphasized, however, that the reported results in no way describe the current status of producing shrink resistance by chemical means.

Specific dyeing problems must be treated individually. If the aim of shrink resistance is to be attained, namely washability of the finished garment, emphasis will be on wash resistant dyestuffs—milling colors and particularly chrome and vat dyes. Solution of the problem is aided by the general tendency of a given color to have greater wash fastness on alkaline chlorinated wool than on the untreated fiber. Resistance to both dry and moist crocking is improved by alkaline chlorination. Light fastness is generally unaffected, though in a few cases it may be slightly inferior.

In the application of dyestuffs, it will be found usual formulas for wool can be employed, with but minor adjustments in most cases. Allowance should be made for the "strike", or initial dyeing rate, which may be more rapid or chlorinated wool. Usual precautions to achieve levelness should be employed, including neutralization before dyeing except for the metallized colors; this because, unlike commercial tops, the wool as received is slightly acid. As we have mentioned, pastel shades are best produced with vat and solubilized vat dyes which, in addition to wash fastness, have the advantage that the wool may be bleached after dyeing to produce bright and clear colors.

References in the literature would have us believe that alkaline chlorination processes invariably cause yellowing of the fiber *(7)*. This may be true of batch processes, in which acid chlorinations appear to produce a bleached white by comparison. On the basis of our experience with the Harriset process, however, we do not subscribe to this general observation.

Bleaching of Harriset treated wool should follow the same general procedure as for untreated wool. Experiments indicate that when bleached in the same way, Harriset wool bleaches more easily than untreated wool; according to yellowness measurements with a Hunter Reflectometer.

Originally we thought the greatest use of Harriset treated top would be in knitwear. It has been most agreeable to discover the increased utility imparted by its reduced felting characteristics to many woven fabrics, such as washable flannels and shirtings. More recently imaginative designers have created new and exciting fabrics such as cool, porous, tropical worsteds and gabardines, made possible by wool of controlled susceptibility to felting.

It is my hope that tonight we have helped in a small way to introduce to you some of the possibilities of this "Fiber of the Future".

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(3) Some Aspects of the Chlorination of Wool to Produce Shrink Resistance. Harris & Frishman, "Am. Dyestuff Reporter", January 26, 1948.
(4) Measurement of the Frictional Properties of Wool Fibers. Frishman, Smith & Harris, "Textile Resarch Journal", August, 1948.
(5) Measurement of the Friction between Single Fibers. Lindberg, "Textile Research Journal", August, 1948.
(6) U. S. Pat. 2,438,328. Speakman-Whewell, Fullers Earth Union, Ltd. March 23, 1948.
(7) Influence of Chlorination on Wool Dyeing, Luttringhaus, "Am. Dyestuff Reporter", July 12, 1948.
(8) The Treatment of Army Socks for Shrink Resistance. "Textile Service Report No. 46," Office of Quartermaster General.
(9) Dyeing and Fastness Characteristics of Aqueous Chlorinated Wool, New York Section, Intersectional Contest Paper, "Am. Dyestuff Reporter", April 5, 1948.

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It is presumed that authors in studying the comments of reviewers and editors will remember that all recommendations are made in a kindly, helpful, sympathetic manner to improve the paper in both literary and technical excellence. Although authors should cheerfully consider suggestions from reviewers and editors, they are expected to defend their position if justified, especially when strictly technical matters are involved with which the authors have an intimate knowledge.

MANUSCRIPTS—Manuscripts shall be typewritten double-spaced with approximately one-inch margins on 8.5 x 11-inch white paper. In addition to the original, at least two carbon copies are required. Pages are to be numbered consecutively with Arabic numerals and each page after the first shall carry the authorship at the very top. Tables and figures shall also be numbered consecutively, the tables with Roman numerals as Table I, Table II, etc., and the figures with Arabic numerals as Fig. 1, Fig. 2, etc. The names of the authors and their laboratories or business connections should appear below the title of the paper.

LITERARY STYLE AND FORM OF PRESENTATION.—In the writing of papers, authors are requested to observe a trenchant, simple style of writing directed to textile chemists and colorists with at least an elementary knowledge of chemistry, physics, mathematics, engineering, textile processes and textile machinery.

In the organization of the material, there should be one or more introductory paragraphs setting forth the occasion, significance and main objectives of the paper and of the method of attack. This should be followed by the body of the presentation, either with discussions interspersed throughout this portion or with a collected section marked "Discussion" after the main body of the paper. Finally, there shall be a brief section at the end entitled "Summary" or "Conclusion." A separately written abstract of not over 200 words shall accompany every manuscript.

Center headings should be employed sparingly and generally will include only very important section headings such as "Introduction," "Experimental," "Discussion," "Conclusions," and "Summary." Side headings (see third paragraph of this *Notice* for an example) shall be indented and run into the text to which they apply, using a period and dash. The publisher will print center headings in bold face type and side headings in capitals.

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Testing and Auxiliaries Group Meeting—

SOME INTERESTING APPLICATIONS OF pH AND SPECTROPHOTOMETRIC CONTROL IN TEXTILE AND DYE OPERATIONS*

E. D. HALLER and M. H. ODEEN

National Technical Laboratories, South Pasadena, California

THE growing complexities of industrial manufacture and the demand for greater mass production have brought about a great need for faster and more accurate process control methods. Many such control problems are being solved by the application of "instrumentation".

In the textile and dye field, two important and widely used instruments are electrometric pH meters and spectrophotometers. These instruments have found a number of applications in textile work for improving quality and uniformity, reducing operating costs, cutting down rejects, etc. Not all the applications of these two instruments, of course, can be presented in this paper. The intention is to review some of the most interesting and to point out advantages of these methods over those previously employed. The instruments used by the authors were Beckman pH Meters, the Beckman Quartz Spectrophotometer (Model DU), the new Beckman Model B. Spectrophotometer, and the Beckman Flame Spectrophotometer.

pH CONTROL.—Until the development of the modern electrometric pH Meter, pH was measured entirely by the use of indicator dyes. This colorimetric method, however, could not be successfully applied to large-scale industrial control, its obvious limitations being dependency on the human eye to judge color and inapplicability to colored or turbid solutions. Other less obvious errors of colorimetric pH determinations also enter into the problem; for example:

1. The pronounced effect of temperature on pH, which is ordinarily ignored in colorimetric procedures since the measurements are usually not sufficiently accurate to justify temperature control.
2. The indicators, since they are weak organic acids or bases, tend to change the pH of the sample solution, especially in the case of solutions with only slight buffering capacity.
3. Colloidal solutions often exhibit specific absorption effects, introducing errors as large as several whole pH units.

Fortunately, modern electrometric measuring methods suffer from none of these limitations on accuracy. The glass electrode is inert, causing no change in the sample being measured; is not affected by substances in the sample (except rarely encountered glass-attacking chemicals as HF); and gives accurate reliable readings in hot or cold samples, in colloidal suspensions, on slightly moist fabrics, or in colored solutions. And recently, a virtually unbreakable Beckman glass electrode was put on the market.

Basically, two models of pH Meters are available for industrial purposes, the portable instrument and the automatic instrument. A portable meter, either battery or AC operated, is designed for laboratory or field use. With this type of meter, intermittent or grab samples are measured for their pH, and process control is accomplished in this manner.

An automatic instrument, such as the Beckman Model R pH Indicator, is designed for continuous operation. In conjunction with a recorder-controller, this meter can be used to regulate processes automatically without the necessity of an operator's constant supervision. Used with a potentiometer type recorder, the automatic pH Meter gives a continuous record of operating conditions which is not only valuable as a permanent reference, but often proves useful for tracking down operating difficulties.

Some of the important applications for accurate pH control in the textile and dye industry are: for proper softening, clarification and neutralization in the treatment of plant water for boilers, dyebaths and finishing operations; to secure reproducible colors, ensure efficiency and prevent waste in bleaching operations; and for economy and product uniformity in finishing operations where water repellants and many resins are sensitive to variations in pH. Representative applications requiring close pH control are discussed in further detail below.

WATER TREATMENT.—For plants which filter their own water, the careful control of pH is necessary to ensure uniformity and efficiency of operation. Changes in the composition of the water are immediately taken care of by the pH Meter.

In the removal of suspended matter not otherwise removed by filtration, coagulation methods may be used which depend upon the accurate control of pH. Fig. 1 shows the importance of accurate pH control in the filtration process, where even a relatively small change in pH greatly affects the efficiency of coagulation, the amount of chemicals necessary and the overall efficiency of the treating operations.

In the treatment of plant water where high acidity or alkalinity presents corrosion or scale-formation problems, pH control, especially by automatic equipment, affords accurate neutralization. In a typical installation, an immersion-type electrode assembly, connected to the indicating meter, is placed in the raw water tank, and any changes in pH are recorded on a chart. The recorder also activates a controlling valve which automatically feeds lime or CO_2 into the system until neutralization is complete. The recorder-controller then immediately shuts off the flow of chemical so that the process is entirely automatic. The advantages of speed of response and sensitivity which this system affords are important since the addition of very little excess alkali or CO_2 easily carries the water beyond the desired neutral pH.

Zeolite and organic ion-exchange processes can be controlled efficiently with automatic pH equipment. In the Zeolite process, for example, corrosion is reduced by regenerating before the softener nears exhaustion, and salt consumption is re-

* Presented at Testing and Auxiliaries Groups Meeting, Augusta National Convention, October 22, 1948.

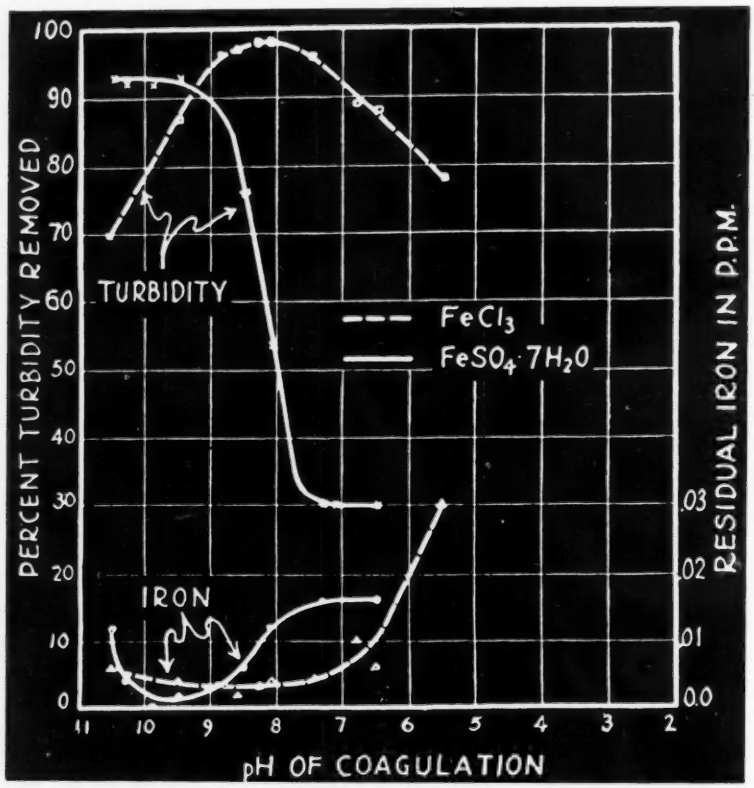

Figure 1

duced because any capacity remaining in the Zeolite is added to the next softening cycle.

WASTE DISPOSAL.—A major problem of dye houses and textile mills is the proper disposal of industrial wastes. The fact that textile wastes are of such a varied nature, ranging from the heavily polluted, corrosive discharges from detergency or scouring wastes to the relatively clean rinse waters, requires careful consideration of its disposal. Although it has been reported that the best method is by combining it with municipal sewage *(1)*, pretreatment is often necessary to provide a blend suitable for discharge into the municipal sewer.

One of the most common methods of pretreatment is a combination of equalization followed by chemical precipitation and settling. In equalization, various wastes from different parts of the mill are mixed so as to provide a uniform effluent. In the case of strong acid or alkaline wastes produced in separate processes, Geyer *(1)* suggests that it may be possible to combine these or portions of them to bring the pH to the isoelectric point. The coprecipitation thus produced, he states, may reduce the cost of further chemical treatment.

(1) John C. Geyer, "Ind. Eng. Chem.", p. 653 (May 1947).

An automatic pH instrument in combination with a flow-type electrode assembly and recorder-controller makes this process continuously automatic and reliable. The controller, set at a predetermined pH, feeds the acid waste into the alkaline waste line at such a rate as to give the desired pH. After precipitation in the settling tank, the waste water is ready for discharge into the municipal sewer or river without fear of corrosive or other severe chemical action.

TEXTILE PROCESSING.—pH equipment is also finding wide application in the control of scouring and finishing operations and in proper maintenance of dyebath solutions. Since much of the subsequent treatment of textile materials is based upon their reaction to acid or alkali, accurate measurement and control of pH are essential. Wool and silk, for example, can be damaged, especially during the scouring operation, by high pH or caustic solutions, although they are comparatively unaffected by low pH or acid solutions (except concentrated acids). Cotton and xanthate rayon, on the other hand, will withstand high pH, but are injured by low pH solutions. Acetate rayon is also sensitive to pH changes and requires careful control since it decomposes in highly caustic solutions.

An interesting reported application of pH is in the reeling of silk from the cocoon. The ease of unwinding the silk depends upon the degree of softening of the gum, which itself is dependent upon the temperature and pH of the water bath.

In further degumming operations, control of pH is necessary to prevent injury to the silk; in the dyeing operation pH influences the absorption of the dyestuff by the fiber; and in the finishing process improper pH control will affect the final color.

M. J. Hoffman *(2)* reports the necessity for pH control in the dyeing of silk. He states that it not only affords complete protection for the silk fibers, but that it permits a better finish of the hose by allowing retention of the right amount of gum to give the hose more body and strength. In his case two water-softening tanks are maintained in constant operation to give a soft water with a pH of 9.2. After first checking the pH of the water to be used in the dyeing and finishing operations, the required amount of water is placed in the dye tub. The goods are then added, along with the degum powder, and the water is raised to boiling. A pH reading is taken as 10.2. The degumming proceeds until the pH is reduced to 9.6 by the acid reaction of the gum removed. At this point a buffer salt is added to the bath, which reduces the pH to 8.5 and stops the degumming operation, permitting retention of all of Sericin "C" as protection to the silk. With a pH of 8.5 optimum dyeing conditions are maintained for mercerized yarn and pure silk in combination. Hoffman states that with a pH control system such as this the material can be run in the tubs at boiling temperature for hours without showing harmful effects.

SPECTROPHOTOMETRIC CONTROL.—The technology of the textile and dye industry is in many cases still an art. Certain pairs of human eyes, for example, are especially valued for their ability to distinguish fine shades of color differences. The last 25 years, however, have seen increasing dependence upon scientific instruments which are inherently more accurate than human judgment. The photoelectric spectrophotometer, because of its infallible color measurement ability, is one such instrument.

Spectrophotometry is defined as the quantitative determination of the relative intensity of energy in different parts of the spectrum. The theory is that, with very few exceptions, each individual compound absorbs and/or reflects various wavelengths of light in a pattern unique to that compound. The

(2) "Cotton", p. 170 (October 1939).

(Concluded on Page P416)

Mid-West Section—

THE RESIN FINISHING OF TEXTILE FABRICS*

ROBERT G. THOMAS
Rohm & Haas Co.

MAN at an early stage in his evolution found it necessary to devise materials to cover his body. It seems probable that his main object was to keep warm, although with certain peoples, modesty rather than warmth was the object. Certainly there are areas where the climate is such that clothes are not necessary to keep warm. Chicago in the summer is so hot that clothes are a burden, yet during my last summer visit to Chicago I recall seeing very few citizens walking down Michigan Boulevard unclad. Obviously, modesty and custom as well as warmth were the driving forces behind the first development of coverings for the body. Probably early man used animal hides before he developed fabrics, but an untanned hide is apt to make a very smelly, unpleasant dinner jacket and the process we know as tanning became necessary. Hence we can say that man's modesty and desire for warmth were the motives behind the beginnings of two great industries, the tanning industry and the textile industry.

The textile industry, then, is as old as man himself. As man developed and as his horizons spread and his needs expanded, the need for fabrics to satisfy his basic wants developed simultaneously, until we have man today with his complex, mechanized world and the enormous sprawling textile industry as we know it.

In the textile industry, as in all industries, there have been periods of stagnation as well as periods of rapid advancement. Our topic deals with the finishing of textile fabrics. Particularly in this phase of the industry have there been periods of great change as well as periods of little progress.

The use of resins in textile finishing is entirely a development of the twentieth century and of the last three decades of the twentieth century at that. Prior to 1920, practically the only textile finishes were natural products, starches, gums, and gelatin to stiffen fabrics, or tallows and oils to soften them. The object of the finisher was either to stiffen or bulk up a sleazy, raggy fabric to make it more attractive and more like a higher count, better quality fabric, or to soften and make more silky feeling a harsh, rough feeling fabric. Generally little thought was given to the end use of the fabric or to how it would perform in the hands of the consumer.

New Developments

Then, shortly after World War I, three new developments took place which had far reaching effect on the textile finishing industry:

(1) THE DEVELOPMENT OF FAST COLORS.—Europe, in particular Germany, had produced these colors for several years. The advent of World War I, and the subsequent restriction of trade with the Continent, brought home with startling reality our dependence on Europe for dyestuffs and chemicals. The war made necessary the development of a domestic dyestuff and chemical industry independent of Europe, making more and cheaper fast colors available to American industry.

(2) THE DEVELOPMENT OF SYNTHETIC FIBERS.—Rayon, nylon, Vinyon, Saran, Aralac, etc. to supplement the natural fibers.

(3) THE DEVELOPMENT OF SYNTHETIC RESINS.—While the synthetic resins have been used on textile fabrics for about 30 years, they have been known and used in other industries somewhat longer. As far back as 1868 Hyatt used celluloid in an imitation ivory billiard ball. This was one of the first experiments with synthetic resins, and Hyatt is today recognized as the father of modern plastics and resin technology. In 1905-1907 Leo Baekeland investigated the phenol formaldehyde resins, and from his work we have the well known Bakelite resins. In 1910 to 1920 Kurt Albert was able to produce phenol formaldehyde resins soluble in the oleo-resinous varnishes, and with the improved solvent solubility he was able for the first time to compete with natural resins in the paint and varnish field. Eventually textile chemists came to investigate these interesting new products with the idea of devleoping special types to replace the natural gums, starches, and oils, with improved effects and durability.

Improvement in Fabrics

With these three major developments in the textile industry there began an era of technical improvement in textile fabrics which is just beginning to come into its maturity. Today, through judicious selection of fiber, construction, dyestuff, and finish, plus a thorough understanding of the demands which the end use of a fabric will place upon it, it is possible to produce a fabric tailor-made for a specific end use, a fabric which will perform its function far more efficiently, and at a far lower cost than was possible twenty years ago. Today it is possible to produce a fabric which has any one or several of the following properties: stabilized against shrinkage or stretch; crush resistant and resilient; vastly improved handle and drape; lightfast and washfast; resistant to water; resistant to flame; resistant to mildew; resistant to insect attack; even resistant to wear and abrasion. If anyone asks me to impart all these properties to a single fabric in a one bath application for ½c per yard, I'll put my tail between my legs and grab a slow boat for China. There is no fiber, no construction, no resin, which is a cure-all, and which will impart all of the above properties, but by proper selection of the fiber, by proper construction of the fabric, by proper selection of dyestuff and finish, by proper engineering of the fabric from its original state to the time it goes to the consumer, any one or several of the properties I have mentioned can be imparted. This is where we stand today. Tomorrow there will be new developments; for in the laboratories of the textile mills, the dyestuff companies and the chemical companies are new fabrics, new colors, and new finishes which will not only improve on what we have today but will open up new uses and wholly new markets for fabrics, and give us fabrics which will outlive and outperform the fabrics we have today.

It is not my intention to claim that resin finishing alone is the answer to developing new uses and new markets, for

* Presented at meeting, Mid-West Section, February 26, 1949.

fabrics-fiber and construction are still the bricks with which you build your house, but finishing is the paint and the landscaping which make the house liveable and attractive.

In other words, finishing in general, and resin finishing in particular, is a new and relatively unexploited tool placed in the hands of the textile manufacturer. Let's take a look at the resin finishes and see what can be done with them.

Classes of Resins

The resins used in textile finishing today fall generally into two classes, thermoplastic and thermosetting. These two types of resin are totally different in physical and chemical properties, in application conditions, and in the effects which they impart to fabrics. Let's look at the thermoplastic type first.

THERMOPLASTIC RESINS.—Thermoplastic resins are supplied as water dispersions of completely polymerized resins. The most common types of thermoplastic resins are the acrylic and vinyl resins. The monomeric resin is polymerized in water in the presence of a dispersing agent, under carefully controlled conditions of heat and catalyst. This type of product is called an emulsion polymer. As the polymerization takes place *in situ*, the tiny monomeric resin molecules link to each other to form complex chains and cross linkages which are called polymers. As the polymers are formed, the dispersing agent present keeps them well dispersed so they do not form conglomerates and precipitate. In the final form the resin dispersion or emulsion polymer is a bluish white, milky liquid containing anywhere from 15 to 60% resin solids. The size of the resin particles is very small and they are extremely well dispersed. The bluish tint is an indication of fine particle size and excellent dispersion, and these two properties result in the deposition of a perfectly clear, uniform film. In this form these products are completely water miscible and may be readily diluted with water to the concentration desired for application. As supplied they are stable to storage at normal temperatures for a reasonable length of time.

Most thermoplastic resin dispersions are either anionic or cationic. The anionic dispersions are compatible with other anionic materials such as soaps and anionic wetting agents, but are incompatible and will precipitate in the presence of cationic materials such as the water repellents or the cationic softeners. The cationic dispersions, most of which are marketed as hosiery finishes—are by the same token incompatible with anionic materials. Recently there have been developed nonionic resin dispersions which are compatible with both cationic and anionic materials, as well as with regularly used concentrations of a wide range of acids, bases and electrolytes. This gives far greater flexibility in processing, since a greater range of additive materials can be used along with them.

The thermoplastic resin dispersions are almost all film forming When the water is evaporated from the dispersion there forms a continuous film. These films vary from soft, tough and flexible, to stiff, firm and hard. I have here some films which were cast on glass plates. From the difference in texture and body of these films it can be seen that many variations in effect can be obtained when a film of a thermoplastic resin is laid down on a fabric. A very soft, drapery handle can be imparted, or a crisp, stiff, starch-like handle.

When considerable heat is applied to a film of thermoplastic resins, it becomes soft and plastic, and tends to flow, hence the name thermoplastic. When the film returns to a more normal temperature it reverts to its former physical state. These resins have no sharply defined flow or melting point; generally it is in the neighborhood of 350 to 400 degrees Fahrenheit. Oddly enough too, the flow point is not predictable from the softness or hardness of the film at normal temperatures. One might think a soft film would have a lower flow point than a hard film, but this is not necessarily true. Apparently the flow point is independent of the hardness or softness of the film, and dependent on the chemical structure of the polymers and copolymers in the resin.

One of the attractive features of the thermoplastic resins is their ease of application. Being dispersed in a water medium, they are readily miscible with additional water and may be easily diluted to the desired concentration. They are most easily applied on a padder or quetch. Usually the addition of a small amount of a wetting agent is desirable to facilitate penetration into the fabric. A light nip is generally required to remove the excess resin. After application the fabric is dried at normal temperatures and finished as desired. Normal drying temperatures of 200-240 degrees Fahrenheit are enough to set the resin on the fibers. Curing or baking at high temperatures is not necessary with the thermoplastic resins.

The effect of these resins on the fiber is entirely physical. To the best of our knowledge the thermoplastic resin molecules do not go inside the fiber, nor is there any chemical reaction between the resin and the fiber. The resin simply forms a very thin film about the individual fiber, modifying the handle of the fabric, but still allowing it to retain its properties as a fabric. The resin film shows amazing adhesiveness to the fibers, hence the finish is very durable to washing and drycleaning, far more durable than the natural products, gums, starches, and gelatins which have been used for years. While a fabric finished with a thermoplastic resin will show some loss of handle upon washing, pressing of the fabric after washing brings most of the handle back. Any loss of hand is not due to loss of resin, but most likely to a breaking up of the film which binds together the cross threads in the fabric. Hot pressing causes the resin to become plastic and flow back again into the interstices of the fibers to bring back most of the original handle. Weight tests made before and after washing show little if any loss of resin upon washing.

Just as the films I showed you vary in body from soft and flexible to stiff and brittle, so may similar effects be imparted to fabrics with thermoplastic resins, and the most important use for the thermoplastic resins in textile finishing is to improve the handle and body of fabrics. I have here some sample swatches which demonstrate far better than I can tell you the effects which may be obtained with these resins. Some of these fabrics have been given a wash after finishing to demonstrate the durability of the finish.

Perhaps one of the most interesting developments in the thermoplastic field in recent months has been the use of these versatile materials in the so-called synthetic starches for household use. I'm sure many of you saw the recent article in *Life* about Permastarch. Permastarch is a thermoplastic resin. The advantages of the use of a thermoplastic resin in the home are much the same as the advantages seen in a mill; essentially no time consuming cooking of a starch mix, ease of application, plus improved durability to washing. The introduction of resins into the home is sure to have effects on the use of resins in the mills, since in the final analysis, it is the ultimate consumer for whom the mill is finishing. A finish which is attractive and more durable to the consumer will be just as attractive and have added sales appeal if applied in the mill.

THERMOSETTING RESINS.—The second class of resins widely used in textile finishing today is that group known as the thermosetting resins. These are entirely different from the thermoplastic resins in chemical structure and chemical properties, in application conditions, and in effects obtainable. Whereas thermoplastic resins become plastic with heat and tend to flow, thermosetting resins are set into an insoluble form by the application of heat and are relatively unaffected by the application of more heat.

Thermosetting resins form a film which is extremely hard and brittle, so hard and brittle and inflexible that one would think the application of such a resin to a fabric would result in a very stiff, boardy, harsh, unattractive fabric. Such a finish can result if the careful finisher wants it to, but also, this resin which forms such a hard and brittle film can be applied to the fabric so that it is hardly apparent there is any resin on the fabric, and a soft, drapey, resilient handle will be the result. The difference in handle depends upon the *location* of the resin on the fabric, whether the resin is within the fiber, between the fibers, or around the fiber. If the resin is within or between the fibers, the handle will be full, resilient and attractive; if the resin is around the fiber, a stiff, brittle finish will result.

The most important thermosetting resins used in textile finishing today are the urea formaldehyde and melamine formaldehyde condensates. These resins are very similar in method of application and in the effects obtainable. The urea formaldehydes were the first thermosetting resins used, and still are the resins used in largest volume and for the sake of simplicity we shall confine our discussion to this type.

Urea formaldehyde resins are supplied in two forms, as monomeric resin, and as partially polymerized resin. The monomeric form is supplied as a creamy white paste containing anywhere from 40 to 60% resin solids. Since these resin creams are monomeric, they tend to self polymerize on storage at normal temperatures, hence must be kept under refrigeration until they are to be used; for to have the proper effect on the fabric they must be applied in the monomeric state, and polymerized within the fiber. If kept under refrigeration at a temperature of 35 to 45 degrees Fahrenheit, however, the monomeric urea formaldehyde resins are stable for reasonable periods of time.

The partially polymerized urea formaldehyde resins are generally supplied as water solutions. This form of the resin is stable to storage at room temperature.

In the application of the thermosetting resins, the first essential is to have a thoroughly prepared fabric, free from sizing agents, waxes, or oils which may interfere with the penetration of resin into the fabric. The best fabric for resin application is one which has been desized, kier boiled, bleached and scoured, and is in a soft absorbent condition.

The method of applying the thermosetting resins will vary somewhat depending upon the type of fabric being processed, the effects desired, and the equipment at hand; but generally, in one way or another, the following conditions must be met for successful application. The resin is dissolved in water at 100 to 120 degrees Fahrenheit, and after solution is complete the bath is cooled to below 100 degrees to prevent premature polymerization of the resin. Just before the fabric is to be run, a catalyst is added to the bath. The catalyst is necessary to speed polymerization of the resin on the fabric. Urea formaldehyde resins polymerize most rapidly and completely in the presence of an acid catlyst, and acid latent catalysts such as diammonium phosphate or ammonium chloride, or buffered mixtures of this type of material, are used. The resin solution is applied to the fabric on a pad or quetch, following which the fabric is dried at temperatures from 225 to 260 degrees F., cured at a temperature of 300 to 330 degrees, afterwashed, dried and finished. An afterwash following curing is necessary to remove any traces of catalyst or surface resin, and to minimize the possibility of odor development. Millions of yards of fabrics have been finished with thermosetting resins, and their application has been reduced to very exact and precise methods through years of plant experience. To go into a detailed discussion of these application methods would take far more time than we have available.

What are the effects which can be obtained with thermosetting resins? There are several, and the effects are very striking;

(1) Crush or muss resistant finishes on spun rayon, rayon blended, and light weight cotton fabrics.

(2) Stabilization of fabrics against shrinkage or stretch.

(3) Glazed chintz finishes.

(4) Improved durability of starch or gum finishes.

(5) Improvement in the fastness of certain direct colors.

(6) Improvement in the wet strength of rayon.

I have sample swatches demonstrating most of these finishes, which I will pass around. Examining and handling the fabric will show, far better than I can tell, the range of finishes which can be applied. Note the resistance of the treated fabric to mussing, and the degree to which the shrinkage has been controlled; the general improvement in handle and drape compared to the raggy, unfinished samples.

These samples are almost all viscose rayon. This fiber is most receptive to treatment with thermosetting resins and by far the largest volume of resin is used on viscose rayon, or on rayon blended fabrics. Recently the use of these resins has extended to other fibers; they are used on wool to make it shrink resistant and on cotton to make it muss resistant. As new fibers are developed, existing resins will be modified and improved, and new type resins will be developed as finishes.

Future of Resin Finishing

We have discussed so far the two most common types of resin finishes, how to apply them, and what they will do to fabrics. What about the future of resin finishing; what new effects will be achieved, what new markets will be opened? I would be naive indeed if I were to leave you with the impression that these resins are perfect, that they have no faults, that there is no room for improvement; because they have faults aplenty, and there is room for improvement to challenge the ingenuity and imagination of researchers and textile finishers for years to come, Resin finishing is definitely not a fly by night proposition; it is here to stay, but the techniques and processes are not going to remain static. There will be constant improvements and expansion of usage, and the unusual and specialty application of today will become the commonplace of tomorrow. What are the improvements we hope to make?

The thermosetting resins have to be cured at temperatures of 300 to 325°F. in order to polymerize the resin completely. This in itself is a disadvantage, since curing is an added expense, and high temperatures tend to degrade and weaken fabrics somewhat. We have found that the thermosetting resins impart remarkable stabilization and crush resistant effects to fabrics. But in order to impart these properties, some sacrifice must be made in other physical properties of the fabric, such as tensile and tear strength, which are generally lowered to a degree. Some day we hope to have available resins which will not have to be cured and will not effect the tear and tensile strength. That will be a big step in that it will make susceptible to resin treatment a whole range of fabrics on which these resins cannot be used now.

I mentioned earlier that fabrics treated with thermosetting resins have to be afterwashed in order to neutralize them, to remove excess catalyst and surface resin, and to minimize the possibility of odor development. Afterwashing is an expensive and time consuming operation, and in the not too distant future there will undoubtedly be available resins which do not have to be afterwashed.

The thermosetting resins on the market today all have an affinity for chlorine. When a fabric treated with a thermosetting resin is subjected to the normal chlorine bleach given in commercial laundries, the fabric picks up and retains the chlorine despite continued rinsing; an untreated

fabric will not retain chlorine. Upon subsequent drying and hot pressing the fabric is apt to become seriously degraded because of the presence of the chlorine. This means, of course, that fabrics treated with thermosetting resins cannot be sent to the ordinary commercial laundry, since this will probably use a hypochlorite bleach. Someday we hope to have available thermosetting resins which will be chlorine resistant.

And of course there is always the question of cost. The thermosetting resins, particularly the urea formaldehyde resins, are cheap; but the thermoplastic resins admittedly are expensive compared to the starches and gums. We are constantly working with cheaper raw materials and experimenting with new production methods to bring the cost down, and thus to make their use economical and attractive on fabrics where at present the cost is prohibitive.

In conclusion, the use of resins for finishing textile fabrics has placed a new tool in the hands of the textile manufacturer and finisher. The last two decades have seen the development of finishes and effects on fabrics which were never dreamed of before. With proper selection of fiber and construction, and with judicious use of the new finishing techniques, the next two decades are sure to see developments in fabrics and finishes and an expansion of the markets for textile fabrics far beyond that of today.

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Spectrophotometric Control—

(Concluded from Page P412)

transmission curve of a liquid or transparent solid (or the reflection curve of an opaque solid) thus provides an exact color analysis of the material.

Although the eye, as the first "spectrophotometer", is as sensitive as the finest instrument today, it lacks both resolving power and the ability to determine quantitatively the energy striking it. In overcoming the eye's limitations, color measurement proceeded through several stages of evolution before it emerged as today's highly accurate science of spectrophotometry.

Intermediate steps in the evolution saw the visual comparison of two colored solutions in test tubes illuminated by white light. Then filters were used which allowed visual comparison at broad regions of the spectrum. Later a densitometer device compensated for differences in intensity, or more correctly, transmission of light. These methods, however, suffered from various shortcomings. Color matchers could not always agree as to what constituted an exact match; filters passed too large a portion of the spectrum; the human eye, still called upon in the final analysis for its judgment, varied too much in its sensitivity.

For making quantitative analyses of solutions, as well as to study molecular structure, it was necessary to select smaller portions of the spectrum than is possible with filters, and to substitute for the eye a photometric receiver which was not only more reliable but which could quantitatively measure the photons of energy striking it.

From visual colorimetry, therefore, the next big step was development of the photoelectric filter photometer, which contained a photoelectric receiver cell to replace the human eye. This instrument, however, still had the disadvantage of filters. The final step was the substitution of a prism or a diffraction grating for filters, and the photoelectric spectrophotometer was born.

Spectrophotometric measurements of solutions are used extensively in the textile and dye industry for such purposes as testing of dyestuff shipments, formulation of dyebaths, routine color control of dyebaths, identification and analysis of dye mixtures, research studies on the exhaustion rates of dyebaths, and many more.

A reflectance attachment (as with the Beckman Model DU and the Model B Spectrophotometers) will adapt the instrument for the measurement of light reflected from solid opaque substances such as finished textiles, carded wool, clays, paper, plastics, etc. Using this well-known application of spectrophotometry, color matching of finished fabrics is easily and accurately accomplished. Of increasing importance is the use of monochromatic reflected light from finished fabrics for the prediction of dyebath formulae. H. J. Selling *(3)* has devised an empirical method for dyebath formulation on the basis of reflectance measurements which, he states, is much better than visual estimates by experienced dyers. He also says that the method should be possible for all types of dyes, provided that the initial dyeing is reproducible.

E. I. Stearns *(4)* describes an "additive function" which can be calculated to determine the effect of adding a dye to a sample. He states that each dye added to a sample changes the curve shape in a predictable way. There are factors, however, entering into the problem which are not governed by theory and which may have to be accounted or compensated for by other methods. Some of these factors, such as differences in dyeing conditions and quality of stock, may cause variations in color shades.

Another important application of accurate photometric measurement in the field of dyes and textiles is in the study of fluorescent dyes. A fluorescence measurement attachment, which attaches to the Beckman DU Spectrophotometer, allows a band of ultraviolet light to illuminate the sample. The resulting fluorescent light is selectively transmitted by a filter and measured as increased stray energy due to fluorescence.

Summary

In the foregoing we have endeavored to cover a large field briefly by selecting a few examples of instrumental methods of analysis and process control in the textile and dye industry. In the measurement of pH, and in the field of color-matching and dyebath formulation ,the instruments now available make the arts of yesterday the science of today.

(3) H. J. Selling, "J. Soc. Dyers & Colourists," *63*, 419-24 (1947).
(4) E. I. Stearns, "Am. Dyestuff Reptr.", *33*, 1 (January 3, 1944).

Rain Tester Blotting Paper

In the interests of uniformity and reproducibility in making tests with the A.A.T.C.C. standard Rain Tester a specially manufactured lot of blotting paper has been made exclusively for textile work. Satisfactory inter-laboratory tests have been completed on a representative cross-section of this lot, and the paper is now available for purchase from:

STANDARD PAPER MFG. CO.
RICHMOND, VA.
Attention: J. S. WALDEN, SALES DEPT.

Stock Size:—24"x38"—240 lb. per ream (500 sheets).

Minimum Order: 25 lb. (Approx. 50 sheets —24"x38").

Price (Subject to change):
For ¼ ream—27c per lb.
For less than ¼ ream—34c per lb.

The manufacturer is willing to cut these sheets to 6"x6" or any other desired size at a charge of $1.00 per ream ($1.00 minimum cutting charge). When ordering, specify "WHITE A.A.T.C.C. TEXTILE BLOTTING" and send order direct to the manufacturer.

In the past it was found difficult to obtain reproducible results or good correlation in inter-laboratory tests through the use of blotters furnished by different manufacturers or even by the same manufacturer. Because of this situation arrangements were made solely with the above company for the manufacture of a special lot of uniformly-made blotting paper. The manufacturer guarantees to furnish a continuous supply of uniform paper.

THE EFFECT OF ABRASION ON BREAKING STRENGTH AND ELONGATION OF FIFTY-EIGHT CLOTHING FABRICS

EVELYN E. STOUT and MARJORIE BELL MOSEMAN

Washington Agricultural Experiment Station

Summary

The effect of abrasion on breaking and elongation has been studied on fifty-eight clothing fabrics of cotton, rayon, wool, rayon-cotton, rayon-aralac, rayon-wool, and rayon-nylon. All fabrics were purchased from retail stores in Washington. Fabrics were abraded a maximum of 500 strokes. Breaking strength and elongation determinations were made in warp and filling directions after each 100 strokes. Cottons proved to be no better than rayons in resistance to abrasion. Some rayons were much improved since the war years. The wool and the mixed-fiber fabrics, except for rayon-cottons, withstood abrasion better than other fabrics studied. Rayon-wool and rayon-nylon twills proved superior to all other fabrics studied in several respects. Percentage of elongation decreased steadily with increased abrasion in all fabrics, with the exception of two fabrics in which percentage of elongation increased after the first 100 strokes, then decreased comparably to the other fabrics. Although withdrawn from further study because of abrasion-worn holes, fabrics still possessed considerable breaking strength as indicated by the Scott tensile strength tester. Mixed-fiber fabrics seem to offer many possibilities satisfactory for use where abrasion is a wearing factor.

THE general dearth of information on the effects of abrasion on commonly used clothing fabrics, and the lack of standardized procedure for studying the effects of abrasion, led to a desire to make the study reported in this paper. While working with the United States Bureau of Human Nutrition and Home Economics on the cooperative project, "Fabric Wearing Qualities," permission was obtained to make an abrasion study of six groups of fabrics. Results of this study proved so interesting that further study on a larger group of fabrics was chosen in order to make better comparisons. It was hoped a procedure worked out in the study might prove to be a standard for use of the abrasion machine owned by the State College of Washington.

Procedure

The six groups of fabrics studied from the U. S. Bureau of Human Nutrition and Home Economics problem included three fabrics each in the following groups: rayon crepe, rayon twalle, rayon challie, rayon crash, rayon-cotton crash, and wool herringbone suiting. All United States Department of Agriculture fabrics were purchased in 1945-1946 in Seattle, Spokane, and Walla Walla, Washington. Results from this small study were used for comparison with the larger study made in 1947-1948.

The fifty-eight fabrics purchased for experiment station study were purchased in Seattle, Spokane, and Pullman, Washington, in October 1947. Fabrics included were: 5 ginghams, 8 chambrays, 6 rayon twalles, 5 rayon challies, 3 rayon crashes, 5 wool flannels, 6 wool crepes, 3 wool herringbone suitings, 5 rayon-cotton crashes, 3 rayon-wool suitings, 4 rayon-wool twills, 3 rayon-Aralac twills, and 2 rayon-nylon twills. The latter three groups were very similar in appearance, "hand", and weight. The same number of fabrics in each group were unobtainable in the shopping areas selected. Rayon crepes were excluded from the experiment station study as they had not all survived the first 100 abrasion strokes in the Bureau fabric study.

The abrasion machine used was a U. S. Testing Company model that requires swatches of fabric 4½" x 6½". The action of the abrading arms is in a straight line back and forth horizontally so that the effect of abrasion can be tested separately in the warp and filling directions. The abradant used was aluminum oxide metal cloth, size 320. Since no provision was made for lint removal, a standard procedure was worked out and used throughout the studies for both U. S. D. A. and experiment station fabrics. By this procedure the abradant was changed with each new fabric sample, and at every 100 strokes the machine was stopped, the abrading arms raised, and all lint was brushed off the sample with a soft cloth. Five-hundred strokes was chosen as the maximum for abrasion. Breaking strength determinations were then made on 10 strips in each direction for each 100 abrasion strokes. Fabrics were retired at the 100 strokes nearest to severe rupture. All breaking strength strips were prepared and tested by the ASTM ravel-strip method *(1)*. Elongation records were made by an elongation attachment on the breaking strength machine at the same time as strips were being tested for tensile strength. In addition to elongation and breaking strength, all fabrics were analyzed for thread count, yarn type, fiber content, percentage of non-fibrous materials, percentage composition, and weight in ounces per square yard by ASTM method *(1)*; and for shrinkage in laundering, colorfastness to laundering, and colorfastness to acid and to alkaline perspiration by Commercial Standard CS 59-44 methods *(3)*. Tests for abrasion, elongation, breaking strength, and weight per square yard were made under standard conditions of temperature and relative humidity.

Discussion

The study produced most interesting results in many instances. The cottons studied were not better than rayons in any respect except wet breaking strength. They had to be retired with the all-rayon fabrics at 200 abrasion strokes. In the USDA study *(2)* cottons were found to have deteriorated more from their pre-war quality than rayons. Results of this study seem to indicate that they have not been improved since that time—some were not so good initially as the war-time cotton. Some rayons have improved much since wartime especially in respect to abrasion resistance. While rayon twalle and rayon challie purchased in 1945-1946 wore out at 100 strokes, those purchased

TABLE I—Groups Means For All Fabrics (1947) Thread Count, Breaking Strength*, and Elongation

Fabric Group	Thread Count (per inch)		Breaking Strength (lbs.)														Elongation (percent)											
			Controls				Abraded 100 Strokes		Abraded 200 Strokes		Abraded 300 Strokes		Abraded 400 Strokes		Abraded 500 Strokes		Controls				Abraded 100 Strokes		Abraded 200 Strokes		Abraded 300 Strokes		Abraded 400 Strokes		Abraded 500 strokes	
			Dry		Wet												Dry		Wet									
	W	F	W	F	W	F	W	F	W	F	W	F	W	F	W	F	W	F	W	F	W	F	W	F	W	F	W	F
Ginghams	74.4	57.9	36.6	22.5	31.1	24.1	28.7	20.4	24.3	18.9							7.4	8.0	10.5	9.1	7.0	6.8	5.7	6.4				
Chambrays	87.9	62.9	35.7	25.3	42.7	28.0	29.8	25.6	26.2	24.3							11.5	9.4	13.4	11.1	9.2	8.2	8.3	8.3				
Rayon twalles	95.6	72.4	30.1	30.5	8.6	7.9	26.7	29.9	24.8	29.4							16.4	14.6	9.3	8.5	13.4	14.8	13.0	14.9				
Rayon challies	69.8	58.3	32.8	24.8	15.2	9.9	27.9	18.5	23.2	12.7							18.1	19.0	16.4	16.1	13.8	14.9	10.5	9.8				
Rayon crashes	47.3	46.2	38.9	38.6	21.1	16.1	38.7	27.9	36.6	19.1							16.4	20.9	17.2	18.2	14.4	15.1	13.7	13.1				
Wool flannels	63.0	48.1	23.9	16.8	14.9	9.7	23.8	16.0	23.5	14.4	22.6	13.0	21.6	12.0	21.3	10.9	21.5	24.1	64.7	50.7	18.1	19.5	16.6	15.2	17.7	13.8	13.6	13.1	17.9	12.0
Wool crepes	51.2	46.4	21.6	15.2	11.5	7.3	18.8	10.5	15.7	8.1	13.4	6.8					24.4	22.1	59.7	45.2	14.7	11.5	12.5	9.3	11.7	7.9		
Wool herringbone suitings	31.2	24.9	21.5	12.9	14.7	7.7	21.9	13.2	21.3	12.6	21.0	12.4	19.8	11.6	19.2	11.2	19.9	21.1	50.8	46.8	18.7	20.4	16.5	19.1	18.0	20.4	17.8	16.8	19.8	15.7
Rayon-cotton crashes	41.3	34.6	37.3	31.5	28.5	23.3	39.5	28.4	37.7	29.8							13.2	14.4	16.3	16.7	11.1	13.1	9.5	11.9				
Rayon-wool suitings	26.2	22.2	28.5	22.9	12.6	9.3	25.1	24.1	26.4	19.3	26.4	17.7	21.7	14.1	17.6	10.8	14.9	20.4	20.3	23.4	13.4	19.5	12.7	15.4	29.2	15.3	13.4	14.0	13.6	13.0
Rayon-wool twills	83.3	74.3	41.3	36.2	18.7	14.8	42.3	36.9	40.6	29.8	39.5	31.8	37.6	28.2	35.6	24.8	16.6	20.5	19.2	20.1	16.3	18.6	14.5	17.5	16.0	18.0	16.1	14.4	17.4	16.2
Rayon-aralac twills	72.3	59.9	51.8	40.8	23.3	13.5	50.5	34.8	45.2	32.6	37.7	28.4	34.7	21.2			12.0	20.8	17.6	10.4	13.6	15.4	13.0	15.6	11.9	15.4	11.1	12.0		
Rayon-nylon twills	84.1	76.0	51.9	46.5	43.6	43.7	44.4	40.7	51.9	47.0	45.5	43.5	41.6	39.2	44.7	42.0	28.2	22.8	24.5	23.9	27.6	26.9	20.3	21.7	22.4	22.4	25.7	21.7	21.8	33.8

* All breaking strength results are corrected to the thread count of the controls.

in 1947 withstood 200 strokes. One fabric in the 1947 twalle group withstood 400 strokes and still had a breaking strength of 15.7 warpwise and 28.1 lb. filling-wise, although so threadbare it could no longer be used on the abrasion machine. Although 1947 twalles, as a group, had to be retired after 200 abrasion strokes, they still had breaking strength twice as great as 1945 twalles had at their 100 abrasion stroke retirement.

Rayon challies purchased in 1947 had a lower initial breaking strength than those purchased in 1945, but withstood abrasion better, losing much less strength per 100 strokes in proportion to the 1945 purchases and lasted twice as long. Rayon crashes gave results similar to 1945-1946 purchases. In that group the fabric that appeared to be poorest when purchased proved much superior to the others and withstood 400 strokes although the group as a whole had to be retired at 200 strokes. Although many fabrics became threadbare in one direction or the other during abrasion, thus necessitating their retirement, they still possessed considerable strength as indicated by the Scott tensile strength tester.

A most interesting result was the superiority of rayon-wool twills over all-wool fabrics in all respects. The initial breaking strength was much superior in the blends, and although they lost comparatively more strength with continued abrasion, at the end of 500 strokes they were still much stronger than the all-wool fabrics, and in most instances still exceeded the initial strength of all-wool fabrics.

Rayon-nylon blends proved superior in breaking strength to all other fabrics initially and maintained superior strength throughout the test period, remaining stronger after 500 strokes than the initial strength of most other fabrics. There were no observable signs of wear for these fabrics during the entire testing period.

With the exception of rayon-Aralac twills in the warp direction, and rayon-nylon twills in the filling direction, all fabrics decreased in percentage of elongation with successive abrading periods. After the first 100 strokes these two fabrics decreased in percentage of elongation also. Greatest elongation loss, with the two exceptions mentioned, occurred during the first 100 strokes, then was more gradual. Fabrics that withstood the full abrasion period of 500 strokes had a tendency to show a greater percentage of elongation during the final 100 strokes than at earlier periods.

Only five groups of fabrics went through the entire test interval of 500 abrasion strokes. These were the rayon-nylon twills, rayon-wool twills, rayon-wool suitings, all-wool flannels, and all-wool herringbone suitings. At the end of the test

period, the rayon-nylon and rayon-wool groups retained breaking strength much higher than the all-wool fabrics, as they had initially.

All fabrics in the 1947 group lasted for 200 or more abrasion strokes, as compared to several war-time fabrics that lasted for only 100 strokes when tested under the same conditions. Fabric groups retired at 200 strokes were: gingham, chambray, rayon twalle, rayon challie, rayon crash, and rayon-cotton crash. Wool crepes lasted through 300 abrasion strokes before withdrawal was necessary, and rayon-Aralac twills lasted 400 abrasion strokes. Rayon-Aralac twills possessed high initial breaking strength and gave good performance in this respect as long as they lasted, but exhibited poor color fastness to laundering and to both acid and alkaline perspiration. They shrank considerably in the warp direction. Abrasion caused powdering of part of the fibers, presumably the Aralac, as this occurred in no other group. Rayon-Aralac mixtures were improved in hand and appearance over such mixtures obtained unintentionally in 1945-1946 purchases, otherwise were quite similar.

Rayon-nylons wavered up and down throughout the test interval for no accountable reason. Averaging warp and filling together takes no account of the sometimes great variation in strength between warp and filling yarns.

Table I gives the group means for breaking strength and elongation for various abrasion periods. All breaking strength results are corrected to original thread count.

Summary

1. In resistance to abrasion gingham, chambray, and rayon-cotton crash were not superior to the rayons studied.

2. All-wool and mixed fiber fabrics, with the exception of rayon-cotton, seemed to withstand abrasion better than other fabrics.

3. Abrasion caused rapid breakdown of chambray, gingham, rayon twalle, rayon challie, rayon crash, and rayon-cotton crash. All these groups were so worn as to cause their retirement at 200 abrasion strokes, although all possessed good breaking strength at retirement.

4. Abrasion directly affected elongation. With successive abrasion periods, percentage of elongation decreased fairly consistently, although not so rapidly as had breaking strength.

5. Rayon-nylon twills seemed superior to other fabrics in all respects.

6. Mixed-fiber fabrics seemed superior in many respects to one-fiber fabrics, and may be the answer to reasonable cost apparel in view of rapidly changing fashion for rapidly-outgrown children's clothing.

Bibliography

1. A. S. T. M. Standards on Textile Materials. Philadelphia-American Society for Testing Materials. 1944, p. 473.
2. Morrison, Bess V.; Fletcher, Hazel M.; Mack, Pauline B.; Morse, Esther C.; Phelps, Ethel L.; and Stout, Evelyn E.—How the War Affected Civilian Textiles.
3. ———— Textiles-Testing and Reporting—Commercial Standards CS 59-44. Washington, D. C., U. S. Department of Commerce—1944.

TRADE NOTES • NEW PRODUCTS

• Show Hours, Textile Wet Processing Exposition

The following will be the hours when the Textile Wet Processing Equipment and Supplies Exposition will be open at the 71st Regiment Armory, 34th Street and Park Avenue, New York, June 6th through June 10th:

Monday, June 6th—2 P.M. to 10 P.M.
Tuesday, June 7th—2 P.M. to 10 P.M.
Wednesday, June 8th—2 P.M. to 10 P.M.
Thursday, June 9th—2 P.M. to 10 P.M.
Friday, June 10th—10 A.M. to 4 P.M.

Tickets for the Exposition are available from the AMERICAN DYESTUFF REPORTER or the management, Exposition for Trades, Inc., 36 West 47th Street, New York 19, N. Y. There is no charge for these tickets for members of the trade.

• To Coordinate Wool Research

Dr. John H. Dillon, Director of Research of the Textile Research Institute and the Textile Foundation, left recently for England, Sweden, Holland and France for a month of conferences with directors of laboratories in the British Isles and on the Continent which are engaged in various important phases of wool research.

Dr. Dillon's study of the progress being made in wool research in important world research centers is the first step in a proposed interchange of scientists and technicians between European laboratories and the Textile Research Institute at Princeton, New Jersey, as part of the world research program recently initiated at the Institute.

This research project, which for the first time is endeavoring to discover methods of improving textures made of all wool by a combination of fundamental research into the physical and chemical properties of wool and by practical manufacturing processes, is being conducted with the cooperation of The Wool Bureau, comprising the International Wool Secretariat, and the American Wool Council, and by important American wool textile interests.

The project is also being supported by the United States Department of Agriculture both with funds supplied under the Resarch and Marketing Act and through an important collateral research program at the Western Research Laboratories at Albany, California.

During his stay abroad, Dr. Dillon will confer with wool textile research scientists at the University of Leeds and the Wool Industries Research Association at Torridon. He will also investigate and report upon work being done by wool scientists in Sweden, Holland and France. An important part of his task will be to develop an exchange fellowship arrangement with the University of Leeds and to develop an information medium by which the results of wool research being conducted in important centers of the world can be made available both to scientific centers and to world textile manufacturing interests in the United States.

The fundamental wool research project at the Textile Research Institute and at the Department of Agriculture Laboratories at Albany, California, is a four-year program for which a total appropriation of $400,000 has been made available.

Modern scientific equipment not hitherto used in fiber studies has been obtained by the Institute and a staff of well known scientists has already developed the first phase of the research program. Selected wools with known breed histories have been obtained from wool growing centers in the United States and from Australia and New Zealand.

• Glasco Equipment Advertisement

Due to an error in the Glasco Equipment Corporation advertisement of December 13, 1948, the statement that a patent was pending for the device featured was omitted. The patent actually is now applied for.

• Summer Laboratory Clinics

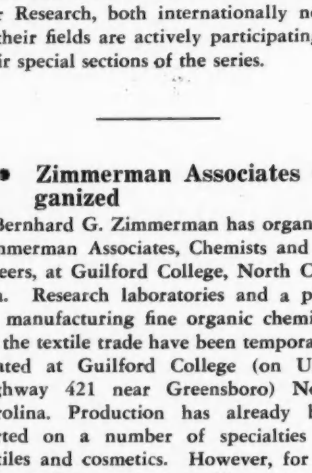
To bring the latest discoveries of experimental scientists into the hands of industrial scientists, the Polytechnic Institute of Brooklyn will present four summer laboratory clinics during the period from June 6 to July 29 under the auspices of its Institute of Polymer Research and its Division of Applied Physics.

"Industrial Applications of X-ray Diffraction" is scheduled from June 6 to June 17, "Advanced X-ray Diffraction" from June 27 to July 2, "Molecular Weight Determination of Polymers" from June 27 to July 1, and "Polymerization Techniques" from July 25 to July 29.

Dr. Isidor Fenkuchen, professor and head of the Department of Applied Physics, and Dr. Herman F. Mark, professor and head of the Institute of Polymer Research, both internationally noted in their fields are actively participating in their special sections of the series.

• Zimmerman Associates Organized

Bernhard G. Zimmerman has organized Zimmerman Associates, Chemists and Engineers, at Guilford College, North Carolina. Research laboratories and a plant for manufacturing fine organic chemicals for the textile trade have been temporarily located at Guilford College (on U. S. Highway 421 near Greensboro) North Carolina. Production has already been started on a number of specialties for textiles and cosmetics. However, for the present, the organization will devote most of its facilities to the manufacture of permanent soft finishes for textile fibers and cotton warp sizing compounds.



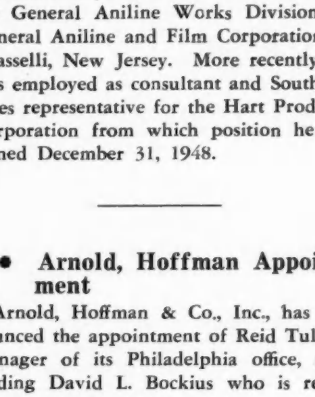
Bernhard G. Zimmerman

Laboratory work will be started in the near future on the production of intermediates and dyestuffs. Plans are now being made for the construction of a vat dyestuff plant in the South.

Dr. Zimmerman, a native of Shiner, Texas, did his undergraduate work in chemical engineering at the Agricultural and Mechanical College of Texas, and his graduate work in engineering and organic chemistry at the University of Texas where he received his Doctorate in 1937. For a number of years he was connected with the General Aniline Works Division of General Aniline and Film Corporation at Grasselli, New Jersey. More recently he was employed as consultant and Southern Sales representative for the Hart Products Corporation from which position he resigned December 31, 1948.

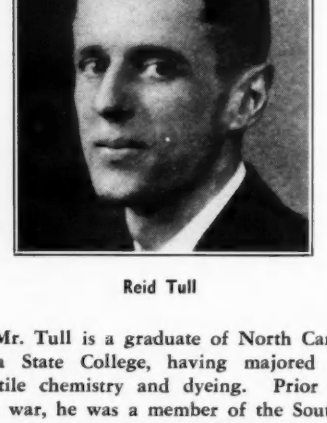
• Arnold, Hoffman Appointment

Arnold, Hoffman & Co., Inc., has announced the appointment of Reid Tull as Manager of its Philadelphia office, succeeding David L. Bockius who is retiring from business.



Reid Tull

Mr. Tull is a graduate of North Carolina State College, having majored in textile chemistry and dyeing. Prior to the war, he was a member of the Southern sales force of Arnold, Hoffman Company and had previously been superintendent of the Rayon Division of the North Carolina Finishing Company. After service with the United States Navy during World War II, Mr. Tull became Superintendent of the Clearwater Finishing Company, Old Fort Division, North Carolina, which position he has held to date.



David Bockius

In a personal letter to the trade, Mr. Arnold, President of the company, has advised that David Bockius retired after having served the company forty-seven years. Mr. Bockius has been a prominent figure throughout the industry and leaves with the well wishes of a host of friends.

• American Cyanamid Appointment

The American Cyanamid Company announces the appointment of C. F. Bonnet as Production Manager of its Industrial Chemical Division, and G. W. Russell as Assistant Sales Manager of the same division.

Mr. Bonnet, who has been with Cyanamid for more than 15 years, formerly served in the capacity of Assistant General Sales Manager of the Industrial Chemical Division.

Mr. Russell, prior to his new appointment, has been Manager of the New Products Development Department, and in his new capacity will take over the sales duties previously handled by Mr. Bonnet.

• Celcos Staple Fiber

Celanese Corporation of America has announced the introduction of a distinctively new chemical staple fiber in the rayon group, called Celcos, said to possess revolutionary characteristics and properties which promise to open up new avenues of use for all textile fibers.

Combining the best traditional features of both acetate and viscose staple fibers and having in addition an ability to cross-dye, an ease of processing and an absorptiveness for resin and other finishes, Celcos is said to be regarded as an ideal all-purpose rayon staple fiber either used by itself or blended with other fibers.

Celcos is produced and crimped in predetermined filament sizes and lengths and in both bright and dull lusters; is said to be more moisture absorbent than acetate rayon staple and less moisture absorbent than viscose rayon staple; to be less thermoplastic than acetate rayon staple; and can be dyed with acetate dyestuffs or with cotton dyestuffs.

The new fiber can be blended with any commercial fiber such as acetate and viscose staple, wool and cotton; and yarns made from it can be plied in combination with any type of continuous filament or spun yarn. By itself, or blended with other fibers, Celcos can be processed

into yarns easily on standard types of carding and spinning equipment. In addition, it can be raw stock dyed readily. Two-tone effects can be obtained when Celcos is blended in a single yarn with acetate staple fiber.

It is stated that fabrics containing Celcos can be piece dyed and finished on conventional equipment. The properties of the fiber are said to permit the use of many dyestuffs which are applicable to cotton or viscose rayon as well as the standard cellulose acetate dyestuffs.

In instances where the soft drape and full hand associated with fabrics made with acetate spun yarns are not wanted, Celcos yarns will absorb finishes and certain resins and thereby provide the crispness and body which may be desired. It is stated that one of the most significant aspects of the new yarn is that it contains and retains the desirable qualities of both acetate and viscose fibers and blends and carries along these qualities in combination with the characteristics of the fiber or yarn with which it is blended or plied.

Celcos in itself or in blends is said to provide finished fabrics with advantages such as a soft drape and fullness of hand common to acetate staple yarn, plus resiliency; easy washability, dry-cleanability and ironability; and improved dimensional stability, thus reducing and controlling shrinkage or stretch inherent in some other types of untreated fabrics.

Celcos fabrics also are said to have a wide affinity for a greater range of dyestuffs, permitting considerable flexibility with respect to color effects. In addition to solid shades, and dependent upon the blend and use of the selected yarns, such effects as cross-dyeing, iridescence, multiple tone and shading or ombre can be obtained.

It is stated that the use of Celcos will permit many various patterned effects, usually confined to fancy goods weavers. The number of combinations of yarns and blends is considerably increased by the use of Celcos in either its undyed state or raw stock dyed state.

Constituting the third member of the rayon staple fiber group, Celcos lies roughly midway between the acetate and viscose staple fibers, with the characteristics of the former predominating. It has only recently emerged from the laboratory and pilot plant stage of development and is claimed to be one of the most significant occurrences in the textile industry during the entire post-war era.

Because of its unique dyeing properties, the possibilities in its variable finishing techniques and other characteristics, production of Celcos will supplement rather than replace Celanese Corporation of America production of cellulose acetate staple fiber. It is reasonable to expect that due to the inherent characteristics of the latter the markets for that product may be expanded when used in combination with Celcos.

• Jones Laboratories Appointment

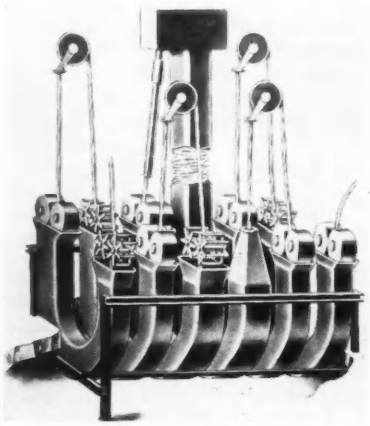
Daniel H. Jones Laboratories of Merchantville, New Jersey, announces the appointment of the Massasoit Products Company of 448 Cold Spring Avenue, West Springfield, Massachussetts, as their New England representatives and distributors for their products.

For the past fifteen years, Daniel H. Jones, Sr. conducted a Mothproofing Consultant and Testing Laboratory at his former address, 328 Chestnut St., Philadelphia, Pa. and recently the Daniel H. Jones Laboratories started to manufacture all mothproofing preparations for their clients and are strictly confining their consulting services to the users of their products.

• Butterworth Junior Bleaching Unit

H. W. Butterworth & Sons Company, Philadelphia, announce a new single stage bleaching unit known as the Butterworth Junior Bleaching Unit. High speed continuous bleaching is now said to be possible in a fraction of the space formerly required. Knit goods or cotton piece goods can now be bleached in an area 13 feet long and 16 feet wide. It is stated that the new machine is extremely compact in size, yet so functional and efficient that it handles cloth at an average of 50 yards per minute.

The Butterworth Junior Bleaching Unit is especially designed for the limited production finishing plant where production does not warrant a full-sized continuous bleaching range.



Butterworth Junior Bleaching Unit—Single Stage System, Showing Squeezer, "U"-type Washers, Saturator and J-Box.

Outstanding features of the new Butterworth Bleaching Unit are the new "U" type washers and saturators made of stainless steel with round corners. The compact machine is a complete operating job fully equipped with squeezers, washers, saturator, J-box, reels, motors, instruments and auxiliary equipment.

The single stage system consists of: One standard squeezer; four "U" type washers; one "U" type saturator; one "J"-type bleaching compartment and four "V" type reels.

The Junior Bleaching Unit is also available as a two-stage system, consisting of: two standard squeezers; four "U" type washers; two "U" type saturators; seven "V" type reels and two "J" type bleaching compartments.

The specially-designed J-box on the Butterworth Junior Bleaching Unit handles 300 to 600 lbs. of cloth per hour Cloth is said to be handled gently and efficiently with patented Butterworth tension control devices.

It is claimed that, compared to kier bleaching, the new Butterworth Junior Bleaching Unit saves up to 75% in steam alone, and 10% in chemicals. Only one man is needed to run the unit as compared with two men on conventional ranges.

• Receives IRI Medal

Dr. Vannevar Bush, who as chairman of the Office of Scientific Research and Development was "chief of staff" for American science during World War II, received the 1949 medal of the Industrial Research Institute on May 2nd.

The award was presented at a luncheon in the Carlton Hotel by H. W. Graham, Vice President and Director of Technology of the Jones & Laughlin Steel Company and Senior Past President of the Institute. E. W. Engstrom, Institute President and Vice President in Charge of Research, RCA Laboratories, presided.

With the medal, Dr. Bush received a scroll bearing the following citation: "Dr. Vannevar Bush for his leadership in the Office of Scientific Research and Development, in marshalling industrial and academic research and coordinating it with the military effort in the common defense, developing an instrument of government so effective as to provide a pattern for continued service."

• Home-Coming Weekend, NBTI

The annual Home-Coming Weekend of the New Bedford Textile Institute Alumni Association will be held on May 20th and 21st with reunions, baseball, banquet, golf and a clambake scheduled. The banquet will be held Friday night, May 20th, at the New Bedford Hotel and the clambake on Saturday, May 21st, at Dan's Pavilion.

• Canadian Aniline Opens New Plant

Canadian Aniline & Extract Co. Limited's new plant for the manufacture of Mono- Di- and Triethanolamine was put into production during the week of May 1st. The Tri product is immediately available in commercial quantities and it is expected that very shortly the Mono and Di will be available.

In addition to the ethanolamine types the company's production of nonionic, wetting, emulsifying agents and detergents is greatly expanded. The company is also producing various salts and condensation products of the ethanolamines.

• Phloroglucinol Price Reduced

Dr. W. S. Guthmann, president of Edwal Laboratories, Inc. of Chicago, announces a price reduction on Phloroglucinol (commercial grade) to a new low of $4.50 a pound.

Edwal Phloroglucinol is available to dye houses through qualified extenders and formulators who are equipped to give technical service.

• Color Harmony Manual

The third edition of the Color Harmony Manual has been announced by Container Corporation of America, 38 South Dearborn St., Chicago 3, Ill. It provides a set of standards for artists and educators, it helps in the discovery and invention of harmony, and serves as a means of specification and coordination in printing, painting, dyeing, and design generally.

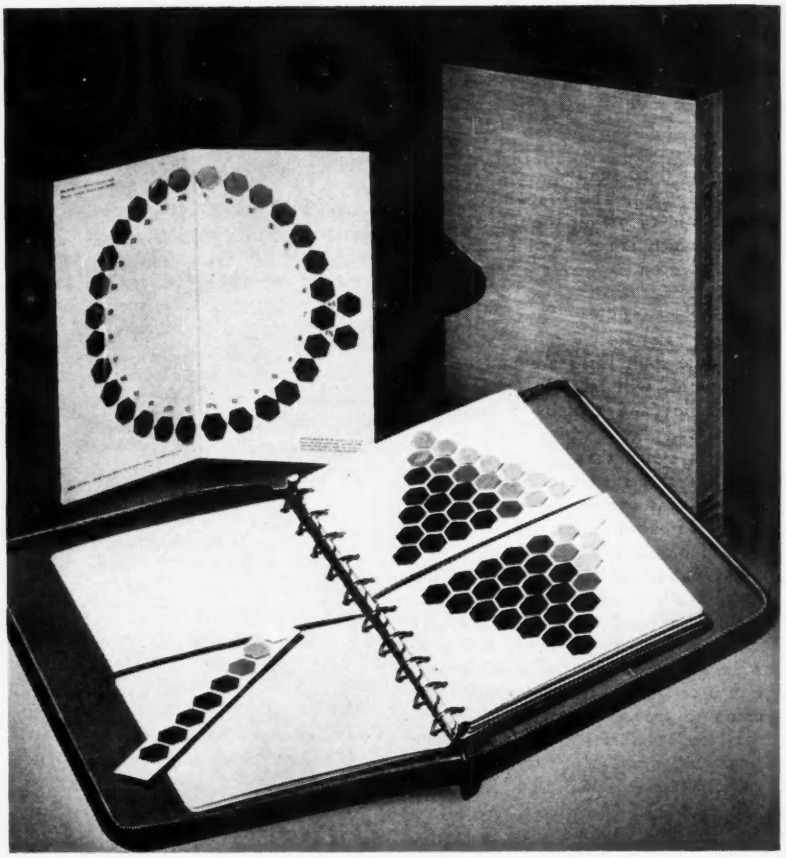
Practical experience suggested many important improvements in this edition, and such a number of modifications based on modern technology have been adopted that it may be fairly described as a further development of the Ostwald system.

Recent research in colorants has made it possible to extend the color range in many regions without sacrifice of permanence and other stability factors. Many of the original colors have been relocated for better interrelation of the various scales and to provide a more useful sampling of the color domain. In particular, the light clear series in the red to purple region have been made much clearer, while small gains of a similar nature have been made in most other hues.

The new Manual has 943 colors, an increase of 263. These extra colors were selected on the basis of their general industrial usefulness and are marked in accordance with the Ostwald notation.

The color chips were made by spraying a mat, pigmented lacquer of appropriate color to one side of a sheet of clear, transparent cellulose acetate. This provides a washable color standard. Furthermore, the double surface feature, mat on one side and glossy on the other, makes for easier comparison to materials of different textures. The color chips are hexagonal in shape, which not only distinguishes them and this edition from the others, but also forms compact triangles in which the monochromatic relationships are more readily apparent.

A complete new text, written for the third edition, accompanies each Manual. Fully illustrated, it explains the theory in detail, as well as the methods of discovering harmonious combinations.



Color Harmony Manual

• L.T.I. Library Drive

In a joint announcement by Kenneth R. Fox, President of Lowell Textile Institute, and A. Chester Clifford, President of the Lowell Textile Institute Alumni Association, it was made known that the current drive for funds for a new Libarry has exceeded $175,000. The realization of this amount was given great impetus by a most generous gift from the Nathaniel and Elizabeth P. Stevens Foundation of Boston, Massachusetts. The ultimate goal of the Alumni Association is $250,000 for a complete Library, fully equipped.

• Index and Abstract Collection

A new subject index and abstract collection of more than one thousand unclassified scientific and technical reports prepared by the Combined Intelligence Objectives Subcommittee and dealing with European technology may now be obtained from the Office of Technical Services of the Department of Commerce.

Of interest to librarians and technical research workers, this publication of the Joint Chiefs of Staff is the first of a series of such volumes. They eventually will include reports of the British Intelligence Objectives Subcommittee (B.I.O.S.) and Field Intelligence Agency Technical (F.I.A.T.) as well as a group of minor reports, all dealing with the technical findings of Allied investigators in Germany and occupied Europe since the war.

The current volume lists reports in 33 major categories and some 80 additional subcategories. Reports with broad im-

portance are listed under more than one category.

C.I.O.S., B.I.O.S., F.I.A.T. and other declassified European technical reports are available to the public from the Office of Technical Services.

PB 96941, *J.I.O.A. Subject Index: C.I.O.S. Volume I.,* 270 pages, sells for $3.00 per copy. Orders should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order payable to the Treasurer of the United States.

• New Container for Aerotex Cream 450

Aerotex Cream 450 is now being shipped in 50 gallon instead of 55 gallon steel containers, according to American Cyanamid Company. The new size drums, which contain exactly 500 lbs. of resin have been adopted to simplify accounting procedures for mills and finishes. Since the new drums are non-returnable and no charge is made for them, further simplification in accounting has been made possible.

The new type of drum is not as high as the former package, and tests are said to show that it should be easier to handle. The company plans to expand this policy and in the near future will ship all of their textile resin products in non-deposit, non-returnable drums.

• Hydrazine Being Produced

Hydrazine in anhydrous form and small quantities of hydrazine sulfate are now being produced by Mathieson Chemical Corporation. Operation of the facility for these products is the result of a contract with the Army Ordnance Department, but limited amounts are also being supplied to commercial interests for test purposes.

Many potentially valuable commercial uses are being investigated and patents already issued suggest that the products may find application in the manufacture of insecticides, bactericides, and plastics, and in textile processing. Also since hydrazine is of value in chemical laboratories as an analytic reagent and in the production of organic intermediates, it is probable that similar uses on a commercial scale will be developed as the compound increases in availability.

• Annual Meeting, Textile Foundation

Franklin W. Hobbs of Boston was elected Chairman of the Board of Directors of the Textile Foundation for the 20th consecutive time at the Annual Meeting of the Textile Foundation recently concluded in Washington. Those present were Secretary of Commerce, Charles Sawyer; Frank D. Cheney, Treasurer, Chairman of Board, Cheney Bros., Manchester, Conn.; Donald Comer, Chairman of Board, Avondale Mills, Birmingham, Ala.; Rhett Y. Winters, representing Secretary of Agriculture Brannan; and Edward T. Pickard, Secretary and Assistant Treasurer. Illness prevented the attendance of Mr. Hobbs. The five members of the Board are appointed by the President of the United States and serve without compensation. It will be recalled that the Foundation was created by an Act of Congress in 1930 and is organized for economic and scientific research for the benefit of the textile industries and their allied branches. It operates with non-government funds primarily in the fields of scientific and economic research and textile education.

Scientific research is conducted in laboratories at Princeton, New Jersey, three of the projects being for the account of the Navy, Quartermaster Corps and Signal Corps. Several of the employees are classified as Research Fellows and spend half of their time working for master's and doctor's degrees in the Graduate School at Princeton University and the other half in the laboratories of the Foundation.

In the area of textile education the heads of the twelve textile schools continue to meet semi-annually under the auspices of the Foundation. All of the schools report much progress in their aim to turn out graduates qualified as material for leadership in the textile industries, as well as possessing high technical qualifications. The deans are planning a trip to England and to the Continent this autumn in order to exchange with the heads of textile schools abroad information of a general and technical character which will enable those responsible for the advance of textile education to adapt their concepts and procedures to the ever changing conditions confronting today's textile industries.

Economic research has pretty generally taken the form of studies of marketing developments or situations, but studies of a more immediate significance have also been launched. In the list of Foundation publications are such titles as Management of a Textile Business, Textile Costing, The Marketing of Textiles, Postwar Prospects for American Textiles and Inventory Policies in the Textile Industries. Just authorized is a brief inquiry and analysis of what sort of economic or statistical information not now available either in total or in the form desired might be useful to textile manufacturers and distributors.

The Annual Meeting was followed by an informal luncheon attended by W. D. Appel, Chief of the Textile Section, National Bureau of Standards; Frank D. Cheney, Treasurer, Textile Foundation; Donold Comer, Director, Textile Foundation; E. U. Condon, Director of the National Bureau of Standards; F. M. Feiker, Textile Foundation Consultant on Textile Education, Dean of Engineering of the George Washington University; Alexander Holtzoff, Associate Justice, District Court of the United States; A. T. McPherson, Chief of the Organic and Fibrous Materials Section, National Bureau of Standards; Edward T. Pickard, G. P. Graham and Faith Morris of the Textile Foundation; Robert West, Deputy Assistant Secretary of The Army, Chairman of the Foundation's Advisory Committee for Economic Research; and Rhett Y. Winters, Research Coordinator, Agriculture Research Administration, U. S. Department of Agriculture.

• Booklet on Ethyl Cellulose

A new edition of the basic technical booklet "Ethyl Cellulose, Properties and Uses" has recently been issued by Hercules Powder Company, manufacturers of ethyl cellulose.

The new edition contains considerable new as well as revised information about this versatile cellulose derivative which can be formulated into plastics, lacquers, varnishes, film and foil, and adhesives. Many indicated applications are suggested by the technical data contained in this booklet.

The booklet is divided into three sections: Introduction, which includes a description of ethyl cellulose's properties; Formulation, which deals with the solvents, resins, plasticizers, and other ingredients used in ethyl cellulose formulations; and Specific Applications, in which end uses for ethyl cellulose are discussed.

The booklet also includes an appendix in which chemical trade names, used throughout the booklet, are identified as to chemical makeup and manufacture.

• Price Reduced on Triton X-100

A reduction of three cents a pound in the price of Triton X-100, a synthetic non-ionic surface active agent, was announced recently by Rohm & Haas Company. The new price, effective immediately, is 38 cents a pound in carload lots f.o.b. the company's plant in Philadelphia. The price reduction was made to give customers the benefit of savings resulting from increased sales volume and expanded production facilities, according to a company spokesman.

The reduction is said to place Triton X-100 among the lowest priced synthetic wetting agents. Among many applications of the material is its use in textile mills as a scouring agent for rayons and wools.

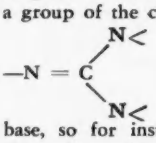
Patent Digest—

(Concluded from Page 402)

Glass Fibers, Dyeing with Water Soluble Acid Dyes on Resin Layer G, 4, 07

U. S. P. 2,462,428
(Ciba Limited, Roesti, February 22nd, 1949)

Various processes for dyeing glass fibers or other artificial filaments having no affinity to standard dyestuffs have been published in recent times (see references below). Most of these methods comprise coating the material with some resinous compounds, optionally blended with mordanting substances. The present invention differs from prior methods in that water soluble condensates are applied to glass, Vinyon or Pe-Ce (polyvinylchloride) fibers, dried *without curing* and introduced into an aqueous dyebath. It is assumed that the pre-condensates, prepared from formaldehyde and special nitrogenous bases, precipitate on the fibers and adhere there firmly to bind the acid dyes of the subsequently applied dye bath. While it is known from the prior literature that all kinds of amino condensates bind more or less acid dyes, not all these condensation products would adhere to glass, etc. The nature of the nitrogenous compound of the pre-condensate is essential for the effect described above. It has to be non-cyclic and has to contain less oxygen (in relation to C) than urea. Moreover no element of a higher molecular weight than 16 should be present in this base. Quite generally a group of the constitution:



is characteristic for the base, so for instance cyanamide derivatives, dicyandiamidine and so on fulfill these conditions. According to an example a glass *or Vinyon* fiber, prepared with a formaldehyde-dicyandiamidine precondensate, is dyed in a 0.5% dyebath of Benzyl Violet 5 BN (acid dyestuff, Col. Index 698) at 75°C. and rinsed until the material does no more give off any dyestuff. The precondensate is applied from a slightly acid solution and no other fixation is carried out, excepted that the prepared fibers are dried before entering the dye bath.

References cited by the Patent Office, among others:

U. S. Pat. 2,317,965 (Gen. Aniline): the fibers are printed or impregnated with resin forming reaction products of ethylene imine with di-isocyanates (thus products of the "Persistol" type) to improve the fastneses of dyes, fixed on glass wool.

U. S. Pat. 2,315,329 (Corning Glass Works): a special glass is prepared, comprising two more or less separated layers, one of them being rich on B_2O_3 and easily leached out by acids whereby the thus obtained pores attract and retain resins, dyestuffs and other substances.

For other references see:

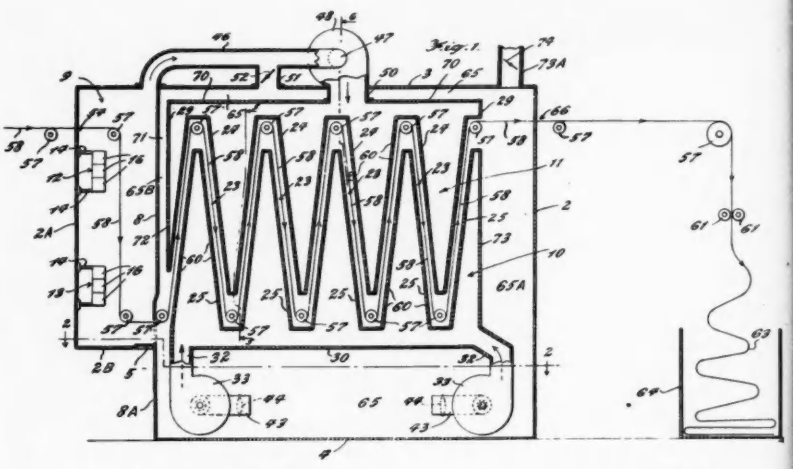
U. S. Pat. 2,428,302 (REPORTER 1948, 383) Owens Corning Fiberglas.

U. S. Pat. 2,436,304 (REPORTER 1948, 568) Corning Glass Works, etc. The resin precondensates, used in the present process have, in contrast to other similar methods, the property of adhering to the glass—or Vinyon fibers without requiring a special curing procedure.

Drying Fabrics— Preheating in a Flame Chamber G, 3

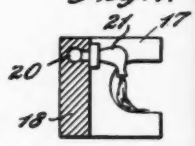
U. S. Pat. 2,456,301
(United Merchants and Manufacturers, P. and F. Miller, December 14, 1948)

The specification describes a closed apparatus, (Fig. 1) partitioned by a wall (8) in a pre-heating chamber (9) and another chamber, completing the drying process. The fabrics (58) enter the first chamber (9) through a slot (54) passing downward close but not too close to the heating elements (16) at a relatively high speed, so that no damage to the fibers can be apprehended; thereafter the fabric is led through a series of passageways (23) formed by V-shaped walls, provided with longitudinal slots (60) whereby the heated gases have access to the material to be dried. Chamber (9) has the purpose of pre-drying but not completely drying the goods. A detail of one of the heating elements is shown in Fig. 4, illustrating the construction of the gas burners, which are built in the body (17). Hot steam is developed by the rapid evaporation of water, carried along with the fabric. This steam is conveyed through the duct (46) and discharged by blower



Drying Fabrics
U. S. P. 2,456,301

Fig. 4.



(48) into the upper part (11) of the drying chamber. On the other hand hot air is produced by burners (42), introduced by blowers (33) from the bottom through ducts (32) into the lower part (10) of the chamber. A door (5) situated at the bottom (28) of the chamber (9) is closed during the operation but opened to introduce cold air when the apparatus is shut off, to prevent burning of the fabrics by residual heat remaining in bodies (16).

References cited by the Patent Office, among others:

U. S. Pat. 2,384,990 (French): a drying device for cloth, comprising a great number of X-shaped members, forming a passageway through which the cloth is led. The drying vapor is withdrawn from the rear and re-conducted to the entrance.

U. S. Pat. 2,225,166 (Erby-Statter): describing an apparatus for drying webs, consisting of a series of drums, heated by an open flame placed in the interior of the drum.

U. S. Pat. 2,220,928 (Amer. Can Corp.): an apparatus for pre-drying a coated object with radiant heat.

Other reference:

U. S. Pat. 2,109,704 (James Hunter Mach. Co.): describing a partitioned drying device using separate chambers, heated to gradually decreasing temperatures.

Other drying devices, heating the material at different temperatures in separate chambers, have been proposed but the principle of heat development by rapid vaporizing moisture in the pre-heating phase for completion of the drying process in the next phase has apparently not been described up to now.

Fig. 4.

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METALLIZED DYES FIND MANY USES IN WOOL DYEING

Calcofast* wool dyes, or metallized dyes, offer many advantages to the dyer and general public. They produce consistently level uniform shades

with excellent fastness to light, washing, sea water, perspiration, carbonizing and fulling. They are especially adapted to the dyeing of wool for sportswear fabrics, suiting, neckwear, knitting yarns for sweaters or bathing suits, and hosiery yarns.

Calcofast wool dyes are recommended for a full range of shades from pastels to deep, rich tones. They can be applied to carbonized wool cloth or stock, without neutralization, with rinsing as the only predyeing treatment necessary.

If additional brightness is required, selected acid dyes may be applied in the same bath with Calcofast wool dyes. The proper selection of the acid dyes to be used is important here and we suggest contacting your Calco representative for assistance.

Calcofast Wool Bordeaux RB Conc. is one of the outstanding metallized dyes, useful as a base shade for fast reds, crimsons, burgundies and maroons.

Calcofast Wool Blue 2G and Calcofast Wool Yellow N are also popular as blue and yellow elements, and Calcofast Wool Pink N is excellent for a range of pink shades.

The entire line of Calcofast wool dyes offers wool dyers good fastness, pleasing shades and ease of application to all types of wool materials.

*TRADEMARK

Tips on Selection of Dyes

Accurate data on the dyeing behavior of direct dyes is important in the economical production of level, well-penetrated dyeings of maximum fastness, especially on material containing mixed fibers and for application in low ratios of fiber to dyebath.

From the viewpoint of dyeing behavior, direct dyes which are to be used in other than extremely high-speed continuous operations should be selected; first, for ability to level up rapidly, and, secondly, for a slow speed of exhaust.

Three basic factors in dyeing behavior are:

- The initial degree of exhaust of the dye on the fiber
- The diffusion rate of the dye within the fiber
- The type of equilibrium between dye, fiber and dyebath.

Care should be taken to avoid those direct dyes which exhaust quickly and which diffuse slowly within the fiber and are unable to migrate with facility between fiber and dyebath.

New Printing Dyes

During the past year quite a number of new additions have been made to the line of Calco printing dyes in the category of vat dyes, soluble vat dyes and stabilized azoics. They are very desirable for either roller printing or screen printing, and are unique in offering very superior light fastness to that obtainable by the usual vat dyes.

Every print shop should investigate the superior qualities of these dyes for their production.

FOR THE TEXTILE BOOKSHELF

Application and Properties of Vat Dyes (Calco Technical Bulletin No. 802)—Contains information about vat dyeing procedure and practical methods of applying Calco Vat Dyes; supported by tables giving fastness properties, relative strengths of Calco Vat Dyes; reduction and dyeing data. The reduction and dyeing behavior of individual vat dyes is discussed.

"Scientific Study of Rayon Dyeing" (Calco Technical Bulletin No. 806)—by G. L. Royer, Research Department. A review of work carried on at Calco on the study of the factors which affect the dyeing of rayon.

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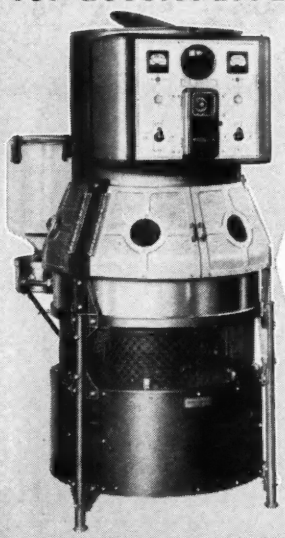

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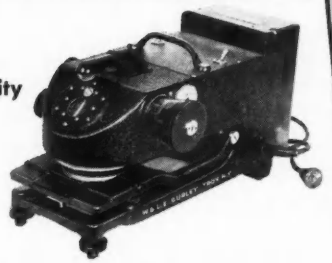

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Wind-proofness, coating penetration, filler-retention and water-resistance are some of the many fabric properties accurately measured with this versatile instrument. Send for Bulletin 1600.

*Conforms to ASTM "Tent. Meth. of Test for Air Permeability of Text. Fabrics"—D737-48T

Gurley Air-Resistance Test of Tightly Woven Fabrics

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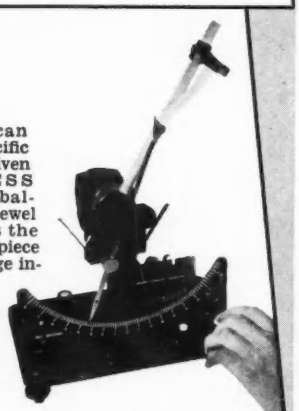

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WANTED: RAYON SKEIN DYER

Must be experienced with direct, sunfast, vats and napthol, to assist our regular Boss dyer. State age, experience, salary expected. Write Box No. 638.

POSITION WANTED: Textile Chemist, Age. 29, broad experience in wet processing and dyeing of cottons and rayons. Formerly in charge of laboratory and dyehouse of well known organization. Superintendent material. Write Box No. 635.

POSITION WANTED—Laboratory and plant trained Textile Chemist with Engineering Degree, desires responsible position affording use of broad interests. Familiar with dyeing, printing and chemical processing of wool. nylon and rayon. Write Box No. 623.

Experienced chemist and chemical engineer desires responsible position with company producing chemical products for finishing textiles. New products developed; plant production supervised. Write Box No. 624.

FOREIGN SALES REPRESENTATIVE AVAILABLE—Dyes and Chemicals, over 20 years' experience would consider executive position with progressive concern N. Y. area or partnership in established business. Write Box No. 625.

POSITION WANTED—Dyestuff Sales Executive and Technician in Domestic and Export field with many years of diversified experience with large company, desires responsible position. In managerial capacity, acquired complete knowledge of foreign market requirements and procedures. Presently employed. Write Box No. 632.

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DYER AND FINISHER—For South American Rayon Weaving Plant. Experience and good references necessary. Excellent opportunity for right man. Write Box No. 630.

WANTED—Finisher for modern piece goods finishing plant. Must be experienced with all types of synthetic, spun and filament fabrics. Also must be experienced with resin finishes. Write Box No. 628.

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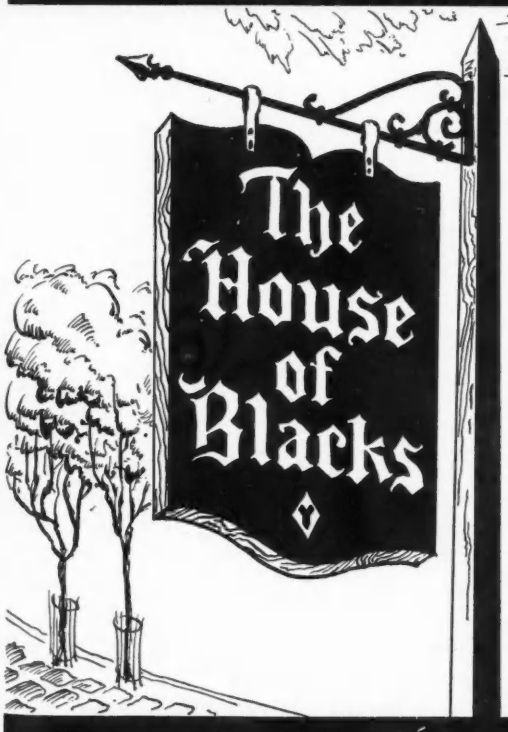

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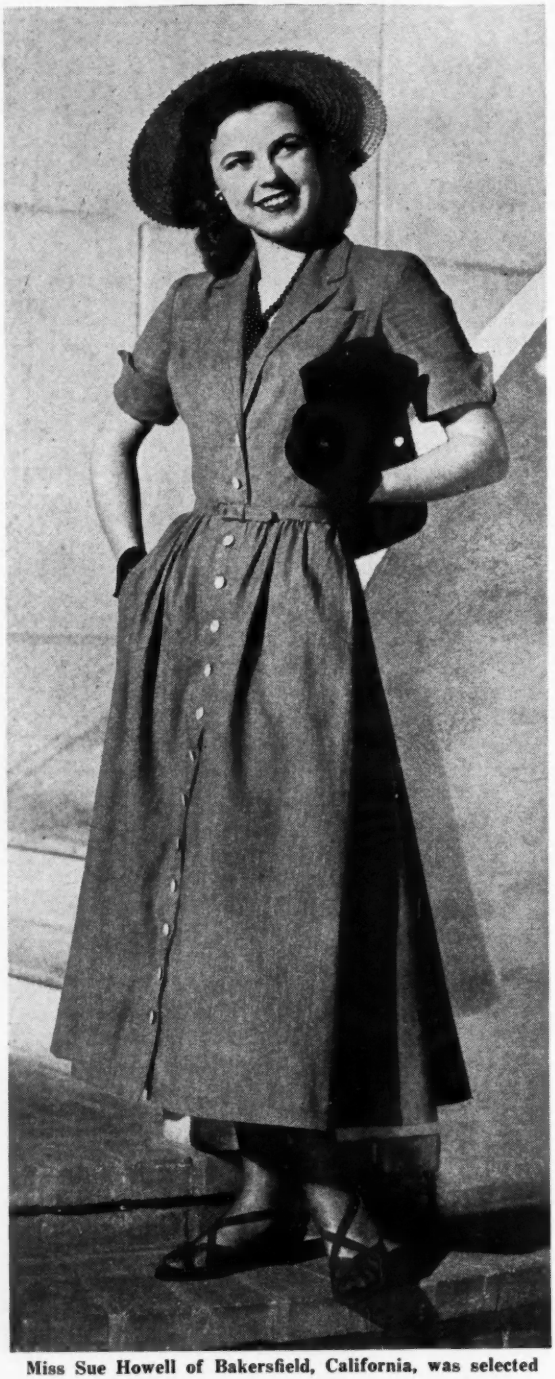

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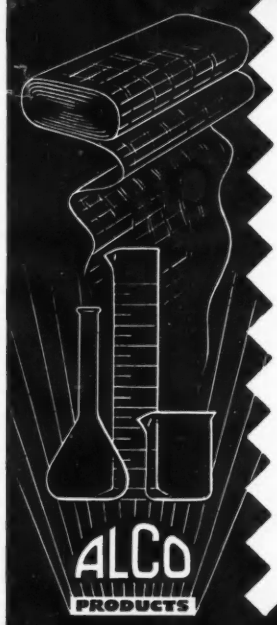

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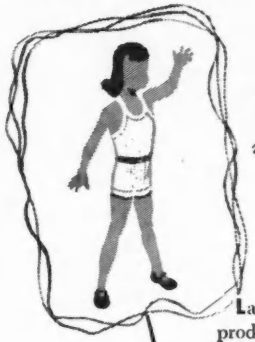

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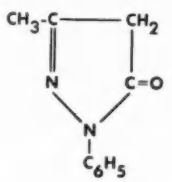

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